



DCS WIFI DIGITAL COMMAND SYSTEM USER'S GUIDE



Take Total Control



SYSTEM REQUIREMENTS

Maximum Power Input:

AC Power Supply

0-22VAC, 190VA, 10.0 AMP

DC Power Supply

24VDC, 10.0 AMP

Auxiliary Power Supply

12-22VAC, 1.5 AMP

Welcome to the world of digital command control! M.T.H. Electric Trains® has developed the most advanced and user-friendly layout control system available in model railroading today. The Digital Command System (DCS) allows you to achieve realistic operation heretofore unknown in the hobby. DCS was designed so that even the most advanced operations can be performed easily, so you can quickly begin to enjoy the hobby at a whole new level.

With DCS you can control every command-capable locomotive on your layout, including TMCC locomotives, independently. For Proto-Sound® 2.0 locomotives, you can adjust lighting, chuff rate or diesel rev level, sound and smoke volume for each locomotive; dial up a specific scale speed; program multiple-headed locomotives to act as one; record and playback an operational script; and much, much more.

These operating instructions include Quick-Connect instructions that tell you how to set up a loop of track quickly and get running right away, so you can gain the benefit of DCS command features as soon as possible. The Quick-Connect section is followed by more advanced connection and operation information.

CAUTION: ELECTRICALLY OPERATED PRODUCT:

Recommended for Ages 14 and up. Not recommended for children under 14 years of age without adult supervision. As with all electric products, precautions should be observed during handling and use to prevent electric shock.

WARNING: When using electrical products, basic safety precautions should be observed, including the following:

- Read this manual thoroughly before using this device.
- M.T.H. recommends that all users and persons supervising use examine the hobby transformer and other electronic equipment periodically for conditions that may result in the risk of fire, electric shock, or injury to persons, such as damage to the primary cord, plug blades, housing, output jacks or other parts. In the event such conditions exist, the train set should not be used until properly repaired.
- Do not operate your layout unattended. Obstructed accessories or stalled trains may overheat, resulting in damage to your layout.
- This train set is intended for indoor use. Do not use if water is present. Serious injury or fatality may result.
- Do not operate the hobby transformer with damaged cord, plug, switches, buttons or case.

This product may be protected by one or more of the following patents: 6,019,289; 6,280,278; 6,281,606; 6,291,263; 6,457,681; 6,491,263; 6,604,641; 6,619,594; 6,624,537; 6,655,640.

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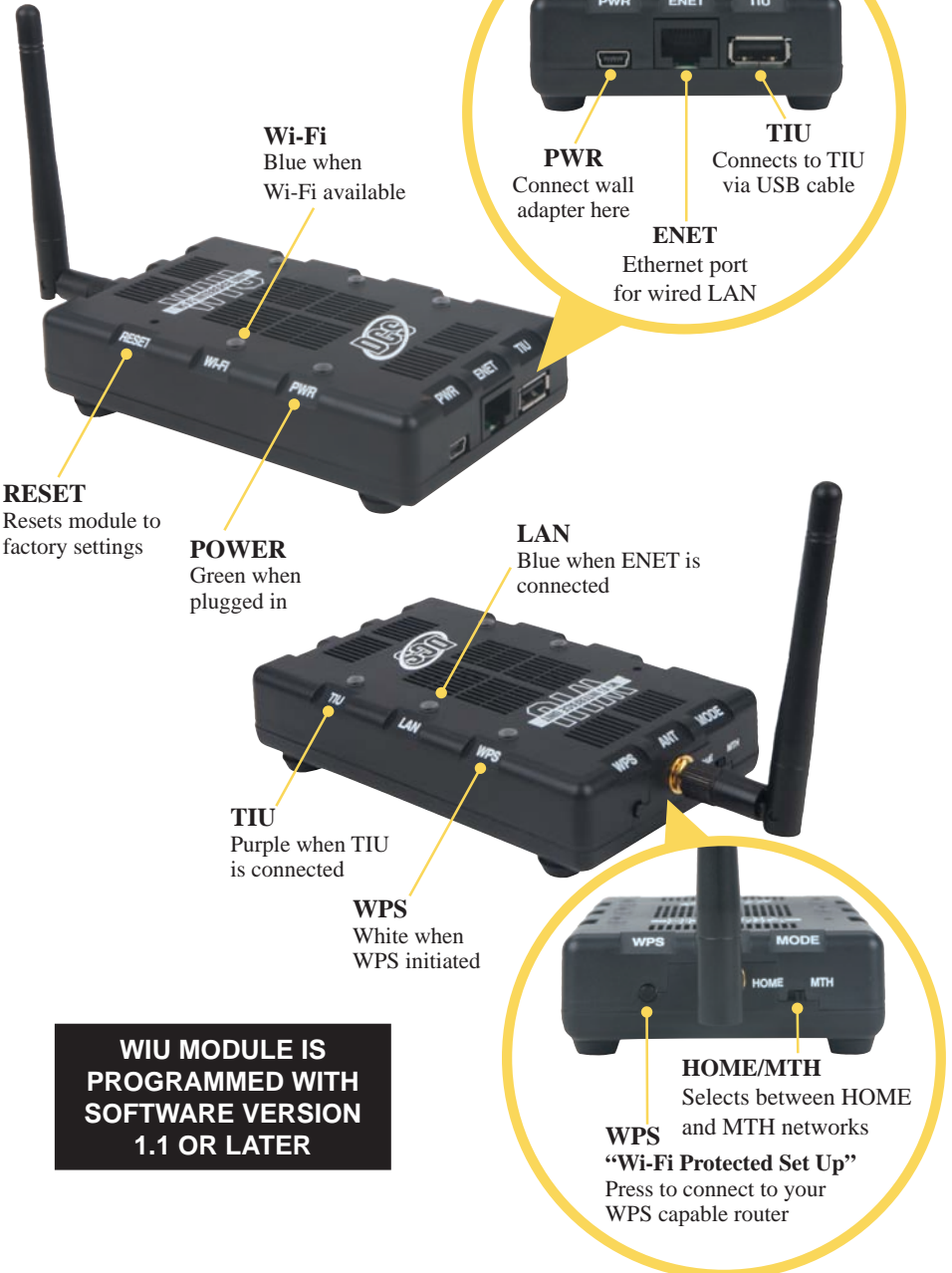
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1

Introduction To DCS

Introduction To DCS

The DCS Wi-Fi Interface Unit

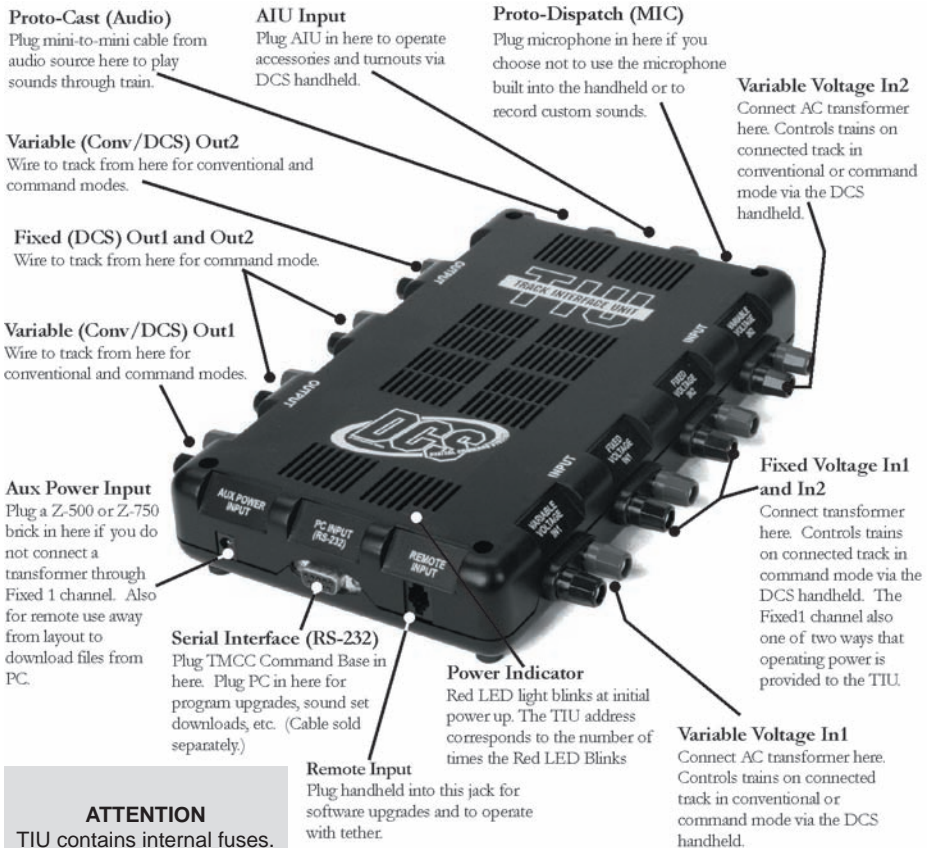


Introduction To DCS

The Track Interface Unit

Also known as the TIU, the Track Interface Unit is the brains behind the DCS system. Connected between the transformer and the track, the TIU receives signals from the DCS Application and relays those signals to each train you are controlling via the rails. The type of signal relayed to the train depends on the operating mode at the time. If operating conventionally, the TIU will raise and lower track voltage to control engine speed. If operating in command mode, the TIU will send a digital signal to each train you are controlling via the track rails.

This digital signal is very powerful and contains a lot of information much like the digital signals used in today's high tech products. These digital signals are what allow DCS to perform the hundreds of functions designed into the system.



ATTENTION
TIU contains internal fuses. If there is no output, open the case (6 screws) and check the fuse.

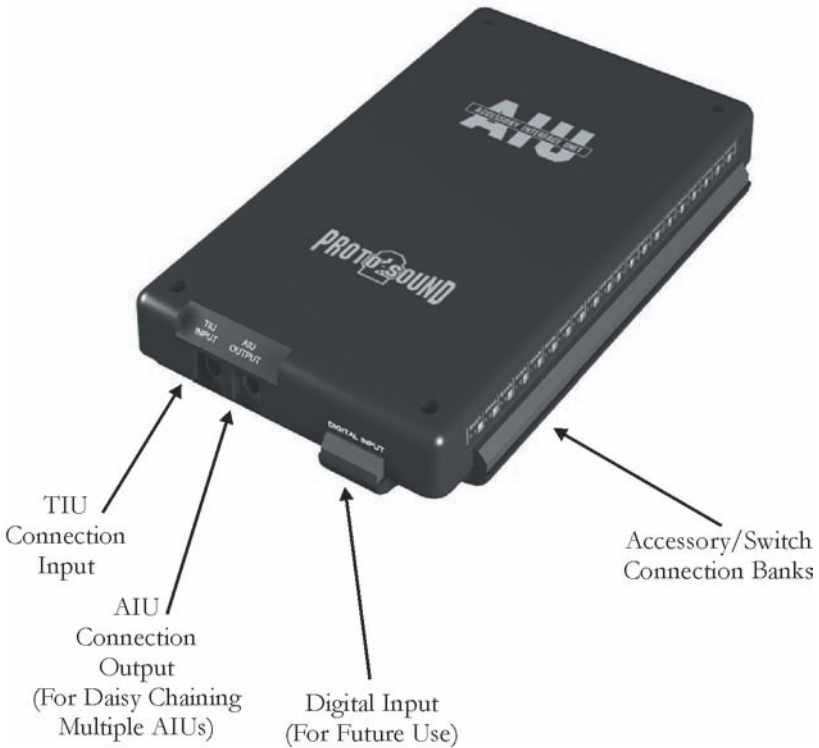
Introduction To DCS

The Accessory Interface Unit

The Accessory Interface Unit, also known as the AIU, plugs into the TIU and controls any accessory or switch wired to it. Each AIU can control up to 10 switches and 10 accessories and features the ability to turn the accessory on or off, or activate it momentarily.

The AIU essentially acts as a large relay and simply replaces the manual switches that are normally used to turn on and off model railroading accessories. Connection to the TIU is done through a special cable (included with the AIU) and up to five AIUs can be daisy-chained to one TIU.

ATTENTION: Connecting the TIU to the AIU output may cause damage to earlier model AIU's



ACC

IN = Armature of Relay
1 = NO (normally open)
2 = NC (normally closed)

SW

IN = AC Common
1 = Straight
2 = Curved

Introduction To DCS

Recommended Wiring Method

It is important for good operation to make the most efficient use of the power and digital signal available on your track. Poor wiring and bad connections offer resistance and can interfere with receipt of the DCS signal and limit the number of engines and cars you can run on your track. Be sure to use proper wire (we recommend 16-gauge or larger paired wire, like speaker wire) and good connections (good connections mean crimp or solder).

Because center rail blackening is not conductive, you may find that the blackening on your track creates resistance that drains power and signal. If so, use Scotch-Brite®, fine-grit sandpaper, or an LGB® track cleaning block to clean the blackening off the top of your center rail.

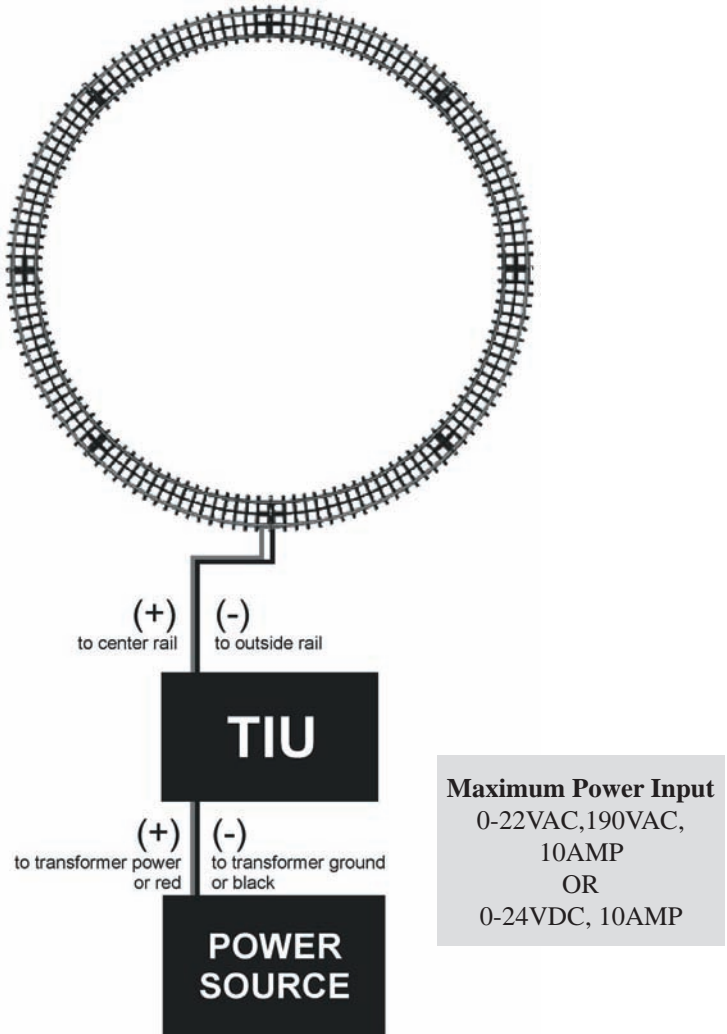
Advanced wiring information and diagrams, including wiring for layouts using blocks for conventional operation, are located in the “Universal Locomotive and Accessory Operation” section of this manual.

Optimal Performance Wiring Principles:

- Use 16-gauge or larger paired wire (such as speaker wire)
- Use a star pattern (home run wiring) to wire directly from the TIU to each lock-on
- Use a terminal block to carry power and signal from one TIU channel to multiple lock-ons
- Avoid common bus wiring
- Solder for tight connections (not required)
- Clean the blackening off the top of the center rail (if necessary)
- Power accessories and turnouts via auxiliary, not track, power
- Place a lock-on (or wire directly to track) approximately every 25 linear feet, both center and one outside rail

Introduction To DCS

Recommended Wiring Method

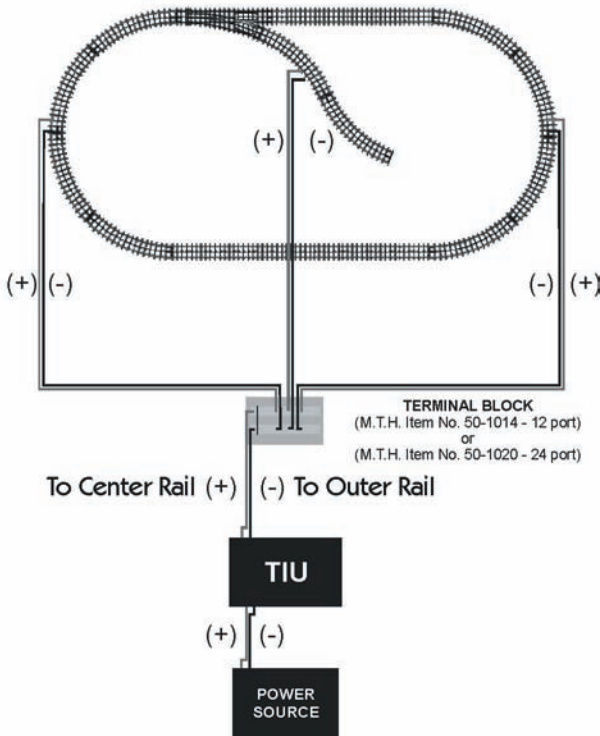


NOTE: This very quick wiring scheme (through the Fixed In 1 and Fixed Out 1 inputs) allows for operation of the connected loop of track in DCS command mode only. Please see the “Advanced Connection” section of this manual in the “Universal Operation” chapter for all the wiring options if you have more complex wiring and operational needs, including conventional mode and TMCC operation.

Introduction To DCS

Recommended Wiring Method

Basic DCS Wiring for Command Layouts
(Large Layouts May Require Lock-ons Every 20-25 Feet)



Optional Additional Equipment Shown:

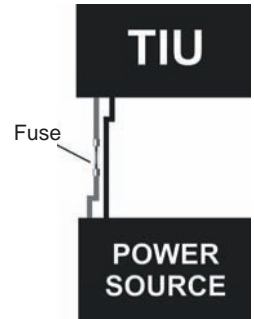
M.T.H. Terminal Block (Item No. 50-1014) The screws in each terminal strip of this terminal block are electrically connected to one another, making it easy to wire the TIU's output into the binding posts and then wire out to several lock-ons from different terminal pairs.

TRANSFORMER NOTE: Although we do not recommend using the DCS System with homemade transformers or those that put out more than 12 amps, virtually any commercial AC hobby power supply will work with DCS. Bear in mind that as you begin to run more and longer trains together, you need to have lots of power on the track. For this reason, we recommend that railroaders with large layouts and long trains use M.T.H.'s Z-4000® (Item No. 40-4000), which is the most powerful UL-rated transformer on the market.

Introduction To DCS

Recommended Wiring Method - Older Transformers

Older transformers, like the Lionel postwar ZW or KW models employ a bi-metallic strip to act as a circuit breaker. The strip responds to heat as high current flows through the transformer. If enough heat is generated by the high current, the strip will open the circuit and prevent further current from flowing out of the transformer. The bi-metallic strip is not a precise overload protection device and does not measure the current. As a result, it may not trip when excessive amps are being generated by the short circuit. Should the strip thus fail to trip, excessive and potentially harmful current could be sent through the TIU.

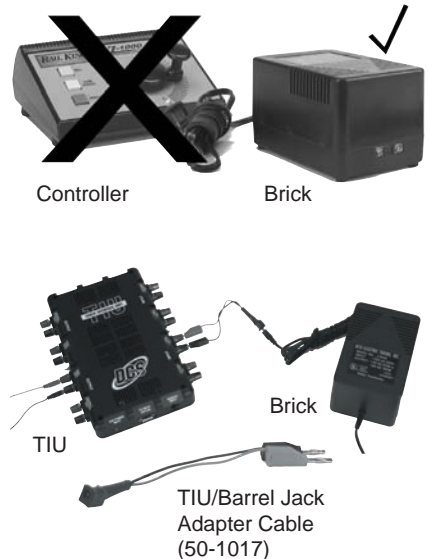


MTH therefore recommends that any user employing an older transformer that does not meet today's U.L. standards install inline fuses or circuit breakers between the transformer and the TIU input channels. An AG3C "fast-acting" or "fast-blow" fuse rated at 15 amps would be suitable protection. These can be obtained from most hardware or electronic stores including Radio Shack. Users will also need an inline fuse holder to house the fuse. Radio Shack sells a heavy duty model, part number 27-1217.

Recommended Wiring Method - Electronic Transformers

Any transformer employing two parts, a brick (step down transformer) and a controller (used to vary the voltage output) may cause operational problems due to low power or poor DCS signal. To correct this problem, MTH recommends connecting only the brick to the TIU inputs. In addition, check the output voltage of the transformer; it should not exceed 22 volts (or 18 volts if lighted cars are used on the track).

When using the Z-500, Z750 or Z1000 electronic type transformer use an adapter cable, MTH item 50-1017, to connect the brick directly to the TIU input as shown below. DO NOT use the controller portion of an electronic type transformer.



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Quick Start: Command Mode

Quick Start: Command Mode

Setting Up And Using DCS - An Overview

Setting up the DCS system for simple command mode operation is quick and easy. The eight steps below are all that is required to begin operating a single Proto-Sound 2.0 or later equipped engines in command mode on a simple layout.

- 1. Connect the TIU Voltage In Channel to the Transformer Terminals.** Connect the black negative (-) and red positive (+) wires from your transformer to the TIU's black and red banana jacks (respectively) on the "Fixed Voltage In1" channel. Make sure the connections are tight.
- 2. Connect the TIU Out Channels To The Track.** Connect wires from the red and black "Fixed (DCS) Out1" banana jacks to your track or lock-on. If you connect directly to the track, red (hot) must be connected to the center rail and black (ground) to the outer rail.
- 3. Open the DCS Application on your device.**
- 4. Put a Proto-Sound 2.0 or later equipped engine on your track.**
- 5. Turn on your transformer and increase the throttle to 18 Volts (or between $\frac{3}{4}$ and full power for older transformers).**
- 6. Add the engine to your App.**
- 7. Select and Start Up the engine.**
- 8. Make the engine go by rolling up the throttle.**

The two Fixed and two Variable channels of the TIU are built differently and serve different functions, although the same DCS signal is sent to the track on all four channels.

Variable channels have internal circuitry that allows them to vary track voltage from within the channel. That means you can vary the voltage on tracks connected to a Variable channel from the DCS Application. These channels are perfect for tracks on which you want to run conventional mode engines (e.g., original Proto-Sound, PostWar, etc.) via the DCS Application.

Fixed channels are straight throughputs. That is, the voltage that enters these channels is the same voltage that comes out, with no voltage variation within the TIU. These channels are ideally meant for command mode operation only. There is, however, one way to set up Fixed tracks so that you can operate conventionally via the DCS Application. If you are using a Z-4000® to power tracks connected to the Fixed channels, you may set up a Z-4000 remote receiver (Item No. 40-4002) for those throttles. The DCS Application is designed to communicate with the Z-4000 remote receiver, and it can vary track voltage that way. Please see the "Advanced Wiring" section of this manual in the "Universal Locomotive and Accessory Operation" chapter for more information about this option.

Quick Start: Command Mode

Accessing the Locomotive

When a Proto-Sound 2.0 or later engine is placed on a track connected to a TIU, the DCS system will bring it up in command mode by default. Because DCS command operation differs in some fundamental ways from conventional operation, please read this section in full before running your trains in command mode.

With a single M.T.H. Proto-Sound 2.0 or later engine (and tender if the engine has one) on the track and voltage applied to the track, press the Menu Button and complete the steps diagrammed below.

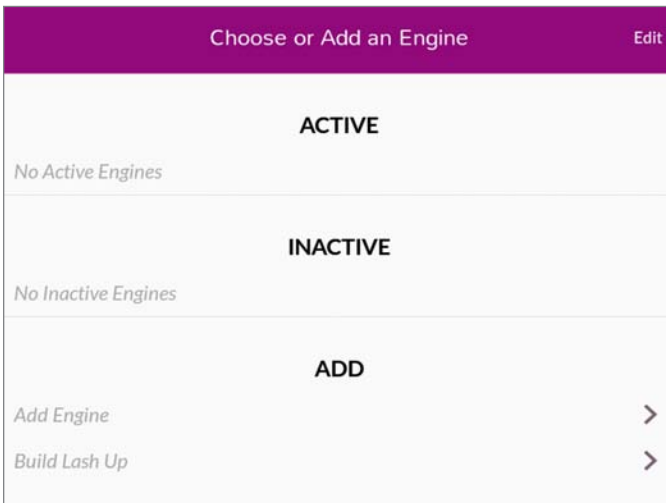
NOTE: When you first power up the track, your Proto-Sound 2.0 or later locomotive remains silent and dark. This is normal; it is in Command Mode and will not start up until you tell it to. The instructions below will tell you how to access and operate that locomotive.

1. Open the DCS Application and tap the **Run My Trains** icon.
2. On the Main Control Screen, tap the **Choose or Add an Engine** icon.

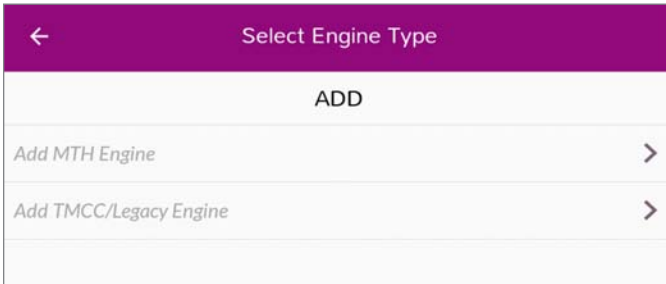


Quick Start: Command Mode

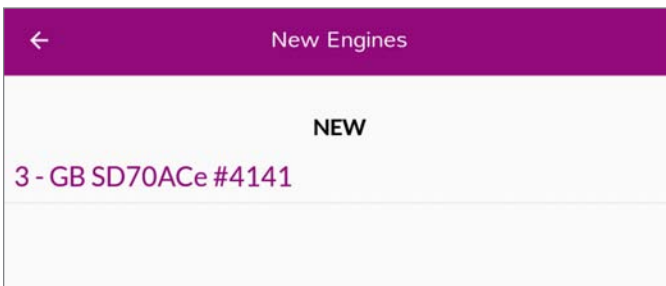
3. Select **Add Engine** from the Engine List screen.



4. Select **Add MTH Engine** from the menu.

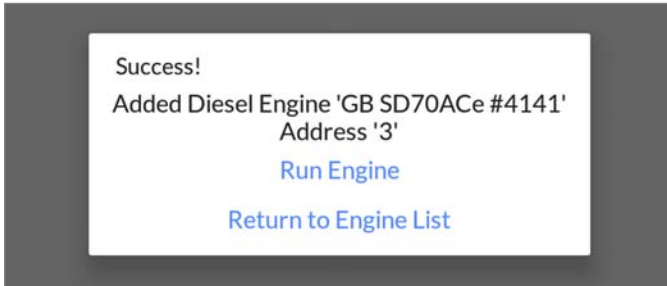


5. Select the engine you want from the available choices listed.



Quick Start: Command Mode

A pop-up **Success!** screen will appear. Because M.T.H. features the SmartRead system, your engine tells the TIU its name and you do not need to enter any information in order to add the engine. This screen will show you the engine you have added.



From this screen, you can choose to return to the Main Control screen and run your new engine immediately, or you can return to the Engine List screen and add additional engines. If you want to add additional engines, remove the added engine from the track, place the new engine on the track, and repeat steps 4 and 5. You need to complete these steps only once per engine, when you first add it to your system, not each time you place a previously added engine on the track.

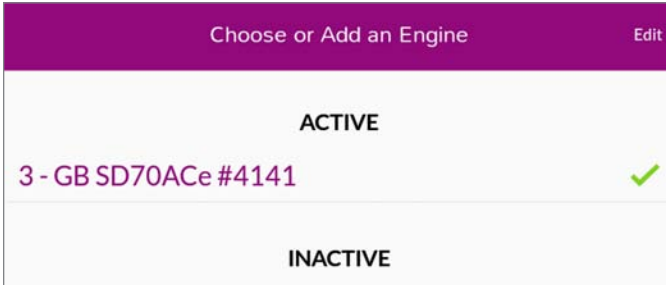
Adding Many Engines

If you own several Proto-Sound 2.0 or later engines and anticipate buying many others, you may find it convenient to establish a dedicated programming track rather than removing all other engines from your track every time you add a new one. Please see the “Advanced Wiring” section of this manual for instructions.

See the System Menu/Engine Setup section in the “Menu Operation” chapter(s) of this book for instructions on renaming, renumbering, or deleting your engines.

Quick Start: Command Mode

1. When all Proto-Sound 2.0 or later engines are added, put the ones you want to run on the track and tap their name on the menu to put them on the active engine list.



2. Tap Start Up to activate the lights and smoke and initiate the engine start-up sounds.



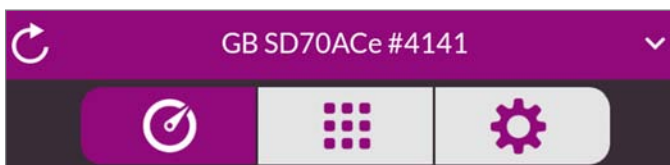
4. Your locomotive is now ready to run. You need to tap the Start Up icon every time you want to run an engine in a new session.

Quick Start: Command Mode

Active and Inactive Engines

Once an engine is added to your system, it will remain in place and always appear on the engine list until you delete the engine. To make it easier to manage the engines being used in a given session, there are Active and Inactive engine lists. Engines currently in use are on the Active list, while other engines wait on the Inactive list until they are activated.

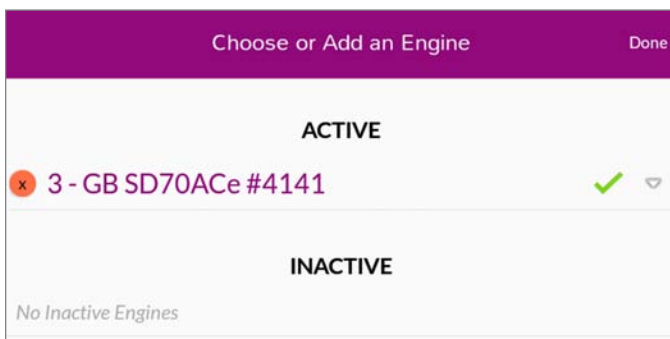
You may update the Active and Inactive lists simply by tapping the down arrow (the Engine List button) on the top purple bar. This will take you to the Engine List screen.



To activate an engine on the inactive list, tap on Edit. An up arrow will appear next to the engine name. Tap on the up arrow to move the engine up to the active list and tap Done. Proto-Sound 2.0 or later engines must be on a powered track to be activated.



To inactivate an engine, tap on Edit and tap the down arrow that appears next to the engine name. The engine will move down to the inactive list. Tap Done when you are finished.



Quick Start: Command Mode

Making the Engine Go

There is no neutral in DCS command mode; the default start-up direction is forward. There are several ways to control the speed of your locomotives.

Speedometer: Tap once anywhere around the circular bezel once to set the speed. The engine will accelerate or decelerate at the default rate. Tap twice anywhere around the circular bezel to set the speed at faster rate. Touch, hold, and drag from the tip of the speed indicator needle around the circular bezel in either direction to select the desired speed.

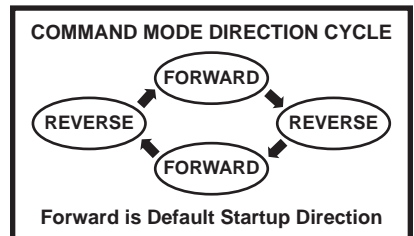
The speedometer will display the engine's speed in SMPH (scale miles per hour). You may also tap the - or + icons to control the engine speed.



Reversing Direction

Because there is no neutral in DCS command mode, DCS engines go directly from forward to reverse. There are two ways to change directions in command mode:

1. Press the desired direction button while the engine is in motion to drop the locomotive's speed to 0 smph. Wait for the engine to come to a complete stop, then select the desired speed for the engine to begin moving in the new direction.



Quick Start: Command Mode

2. Tap the bezel to 0 SMPH and wait for the engine to come to a complete stop. Then tap the new direction arrow and finally the desired speed.

If you slow the engine to 0 SMPH and then resume motion without tapping the new direction arrow, the engine will remain in its current direction.

Basic Sounds

The Bell and Horn/Whistle icons operate the bell and the horn/whistle the same way in command mode that they do in conventional mode:

Horn/Whistle: The horn/whistle will sound for as long as you depress the icon. It will stop when you release the icon. The Proto-Sound 2.0 or later horn/whistle's ending sounds are designed to vary with the amount of time you hold the button.

Bell: To sound the bell, tap Bell icon. To turn the bell off, tap the Bell icon again. The bell will continue to ring from the time you turn it on until you press and release the icon again to turn it off. When you turn it off, the bell sound effect fades out, ringing fainter until it stops, just like a real bell.

Shut Down

1. To shut down the locomotive at the end of a session, stop the engine.

2. Tap the Shut Down icon to turn off the sound, smoke, and lights. The locomotive will play a short series of realistic shutdown sounds before it falls silent. Repeat with all active engines. Note that power is still on the track after shut down.



3. Close the DCS Application and turn off your transformer.

Quick Start: Command Mode

Moving Between Active Engines

When more than one engine is addressed and operating, you can easily move among the different engines and control each in turn.

1. Tap on the name of the active engine, which will bring you to the Engine List screen.
2. Tap on the name of the engine you want to address.

DCS TIP: The App will point at the last engine addressed, allowing you to jump easily back-and-forth between two engines. This Jump function works like the “Last” or “Previous Channel” button on a TV remote control.

Controlling All Active DCS Engines at Once

If only DCS engines are on the track, you can send the same command to them all at the same time. To issue the same command to all active Proto-Sound 2.0 or later engines simultaneously:

1. Ensure there is more than one active engine list on the **Engine List screen**.
2. Select the **All Engines** box and return to the **Main Control Screen**.
3. Hit **Start Up**.
4. Send the commands as described in the One-Touch Operation Chapter.

DCS TIP: If an engine is listed as active on the LCD but is not on the track or is listed as inactive but is on the track, the ALL command will not work. Press **Refresh** to update the active engine list. Active TMCC engines will not respond in ALL mode.

Congratulations! You are now operating your locomotive in command mode! For more instructions on basic command mode operation, see the “One-Touch Operation” chapter of this manual.

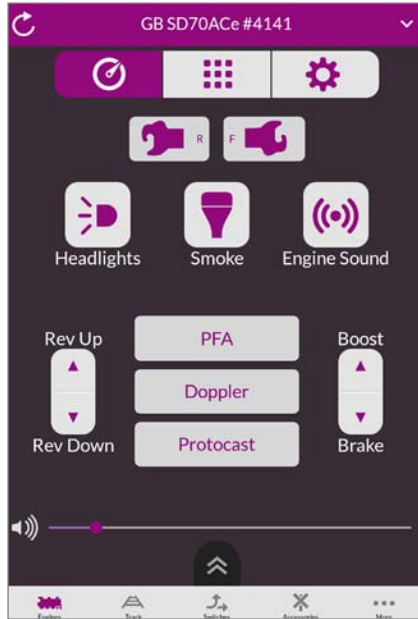
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**One-Touch
Locomotive Operation**

One-Touch Locomotive Operation

Alternate Control Screen

From the Main Control Screen, tap the Down Arrows icon at the bottom to bring up the Alternate Control screen. The Alternate Control Screen provides quick access to features commonly used while running trains.



Couplers F/R

Tap the F Coupler icon to open the front coupler, if your locomotive is equipped with one. Tap the R Coupler icon to open the rear coupler, if your locomotive is equipped with one.

When engine sounds are on, coupler release sounds will play as the coupler is fired.

Headlights

With the engine stopped, tap this icon to turn headlight on and off.

Smoke

Tap this icon to turn the smoke unit on or off. Because of the way the smoke unit works, it may take a few seconds after pushing the button before you see the smoke start or stop.

For instructions on setting the smoke density level (to minimum, medium, or maximum), please see the Control Menu in the “Menu Operation” chapter of this book.

Engine Sound

Tap this icon to silence engine and accent sounds. The horn and bell will still sound if triggered. Tap it again to restore sounds at the previous volume.

One-Touch Locomotive Operation

Labor/Rev Up - Drift/Rev Down

Tap and hold the up or down arrow to activate labor or drift chuffing sounds in steam locomotives. Labor/Rev Up will see an increase of smoke output corresponding to the sounds of the engine working harder. Drift/Rev Down will see a decrease of smoke output corresponding to the sounds of the engine working less hard.

NOTE: Diesel engines will display Rev Up/Rev Down on this button. Tapping the up or down arrow will increase or decrease the sound of the engine rev level.

For diesel or electric engines, the change in sound will become more pronounced with each tap until you reach the system limit of eight REV levels. The sound level will remain as you set it until you tap the opposite arrow to return the engine sounds step-by-step to normal. The system automatically resets the sound REV level to a prototypical level based on the engine's speed.

For steam engines, as soon as you release the button, the sound will return to the normal steam chuff setting.

There are three degrees of chuff (drift, normal, labor) in steam engines and eight degrees of diesel revolutions above idle. Your diesel's default rev sounds depend upon how fast it is running.

Smoke output in diesel engines increases or decreases relative to engine REV levels.

NOTE: Your engine's default setting is to go into labor/drift mode automatically when the system senses that speed has changed. As soon as you use these arrows, the system is changed from Auto to Manual setting. To put the Labor/Drift setting back into Auto, you must do it through the menu. See the System Menu/Proto Chuff section of the "Menu Operations" chapter(s) of this manual for instructions

CAUTION: Operating your engine in Labor or Rev Up mode with increased smoke output for extended periods of time uses large quantities of smoke fluid and may cause the wick to burn if it is not replenished. Check your smoke fluid levels more frequently than normal if you frequently operate in labor/rev up mode.

PFA

1. Press this button to activate Passenger/Freight Announcements (LCD will show PFA = On" or PFA = Off).
2. Press the Direction button to stop the train, then press it three more times, pausing for several second as described in your engine's conventional mode operating instructions, to cycle through the PFA sequences.
3. When the entire PFA script has run, the bell will begin to ring and the engine will pull out at the speed you had set when you pressed the PFA button. If you wish to run the engine at a slower speed than when the PFA was activated, scroll the SMPH to the desired speed. When the engine begins to move, scroll the SMPH one additional setting to lock in the new slower speed.

One-Touch Locomotive Operation

Doppler

Press this button to activate the Proto-Doppler feature for one-time use (LCD will show Doppler = On” or “Doppler = Off”). Engine sounds will initially drop, then build to a peak before fading away. Press the DOPPLER button again after the effect has played to turn the feature off and return the locomotive to normal engine sounds.

Protocast

To activate this feature, you must first connect an audio source to the DCS system.

1. Plug a male-to-male mini cable (1/8” plug, like that used for the headset with a portable CD/tape player or M.T.H. Item No. 50-1009) first into the Proto-Cast port of the TIU, then plug the other end of the cable into your audio source’s headphone jack or line-out jack.
2. Play the recording according to the audio source’s instructions.
3. Press the “PROTOCAST” button to play the recording through your engine. When the Proto-Cast feature is enabled, your regular engine sounds are silenced so that the recording may be heard clearly. A (C) appears on the LCD to indicate that Proto-Cast is in use.
4. Press the button again to stop the feature and return to normal engine sounds.

You can use Proto-Cast in only one engine at a time (the active engine at the time the feature is selected). Because Proto-Cast uses a large share of the microprocessor’s processing power in the TIU, activating other features while running with Proto-Cast may cause interruptions in the audio.

DCS TIP: Because Proto-Cast sends such a large digital signal on the track, it is important that your track be clean when you run this feature. If you get popping and distortion while running Proto-Cast, please clean your track. The large digital signal also means that playing the audio source too loudly can result in sound distortions; resolve this by turning down the audio source volume.

Boost/Brake

Tap and hold to temporarily increase or decrease the speed. When released, the engine will return to the previously set speed.

NOTE: The Brake button can be held until the engine comes to a stop.

Master Volume Slide

Tap, Hold, and Drag the circle on the slider to set the master sound volume.

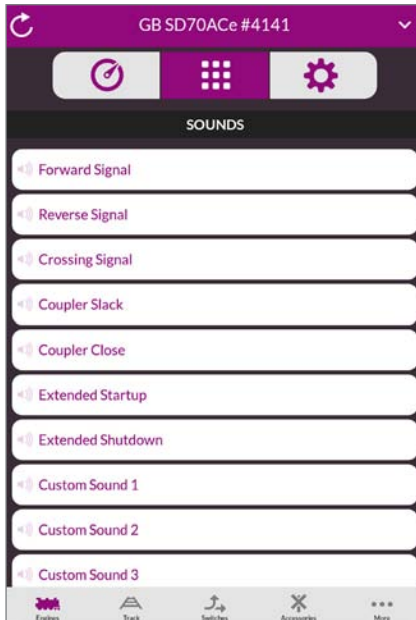
To control the volume of individual elements of the sound set (i.e. horn/whistle volume, bell volume, engine sounds volume, and accent sounds volume), see the “Sound” menu.

One-Touch Locomotive Operation

Softkeys

Softkeys are designed to serve different functions with different engines rather than have a fixed function like the other One-Touch keys. This flexibility is important because the wide variety of M.T.H. engines has an equally wide range of appropriate operating features. For instance, a modern diesel has very different operational features than an early twentieth-century steamer.

The appropriate options for each engine are displayed on the Engine Softkey screen as you control that locomotive.



A large, bold, gray number '4' is centered on the page, serving as a background for the text.

Menu Operation: Sound

Menu Operations - Sound

The DCS system has four primary screens for engine operations: Main Control Screen, Alternate Control Screen, Softkey Screen, and Settings Screen. As with all command mode controls, the menu sets engine-specific features only for the engine selected when the setting is made. Although the features are advanced, they are easy to access and set.

Menu settings are stored within the engine. That means that a setting, such as chuff rate or smoke volume, that is selected in command mode remains at that setting even on other layouts or in conventional mode. If you will be operating in conventional mode later, be sure to adjust all settings as you want them before you leave DCS.

Main Control Screen

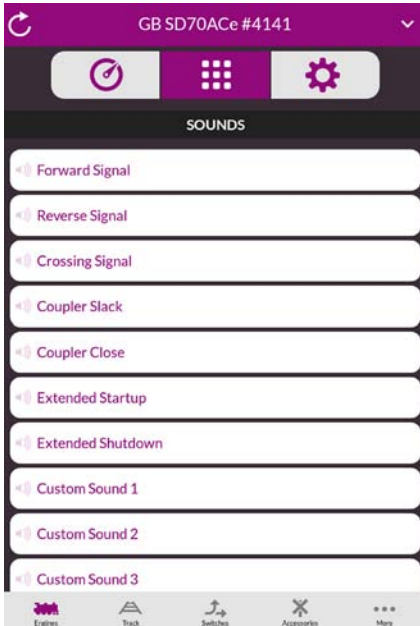


Alternate Control Screen

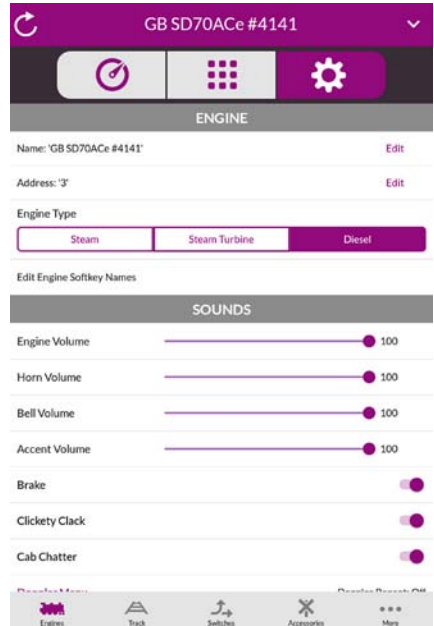


Menu Operations - Sound

Softkey Screen



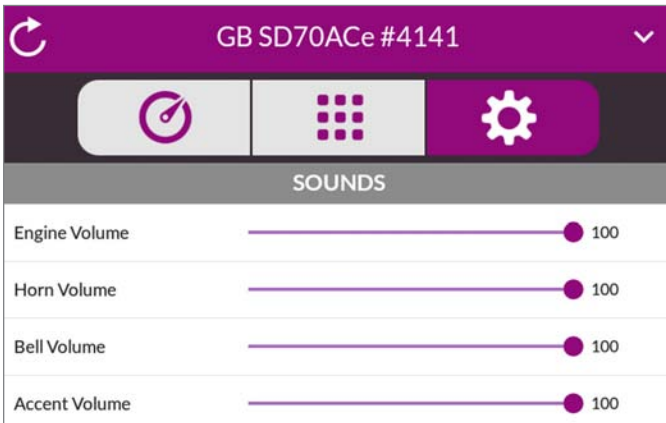
Settings Screen



Volume Controls (Engine, Horn, Bell, Accent)

Custom set the volume of the engine's bell, horn, engine sounds, or accent sounds (e.g., passenger or freight sounds, cab chatter), independently of other engine sounds. The selected sound will play when this feature is selected (except for Accent Sounds), so you can hear it change volume as you make the adjustment.

Tap, Hold, and Drag to adjust primary engine sound volume. As you change the volume, you will see the percentage of maximum volume you hear. You will also hear the change in the selected sound's volume relative to the other engine sounds.



Menu Operations - Sound

Proto-Whistle

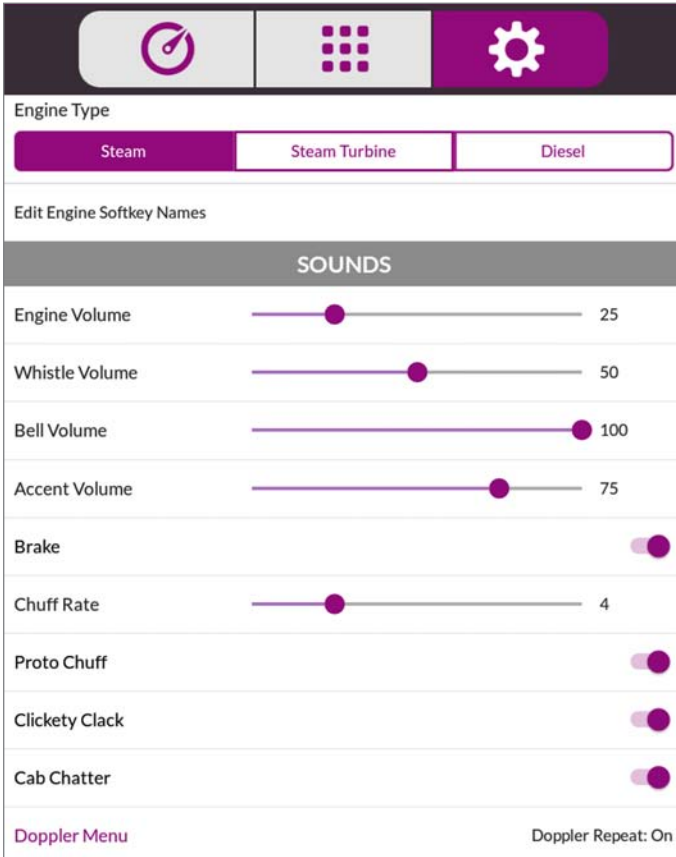
This feature allows you to use the thumbwheel to simulate the engineer's feathering or "quilling" of the whistle/horn rope, producing a much more realistic whistle/horn sound.

Proto-Whistle is not available on all DCS-equipped engines. This feature will only work on those engines whose hardware is capable of utilizing the software feature. Therefore, the softkey acronyms will not be visible on the DCS screen for locomotives not equipped with the proper hardware. Downloading the sound set from a locomotive equipped with the Proto-Whistle feature and loading it into an engine not factory equipped with the feature will not give the user the Proto-Whistle feature even though the Proto-Whistle softkey acronyms will appear on the DCS screen.

1. Select the Proto-Whistle-equipped engine in the DCS App.
2. Double tap the Horn/Whistle icon and it will turn purple.
3. Your display will change to indicate that Proto-Whistle is active.
4. To disable the feature and return to controlling your engine, double tap the Horn/Whistle icon again.

NOTE: When Proto-Whistle is active, your regular Whistle/Horn button is inactive.

Menu Operations - Sound



Chuff Rate

Change the number of chuffs per wheel revolution in your steam locomotives. Most Proto-Sound 2.0 or later steam engines are set at two chuffs per revolution because that rate sounds good even at fast toy train speeds. However, most steam engines prototypically have four chuffs per revolution. You can choose the rate you want, up to 16 chuffs per rev.

Tap, Hold, and Drag the slider to adjust the Chuff Rate in the Sounds menu.

Your engine's puffing smoke is synchronized with the chuff rate, and the smoke puffs will also change rate when you change the chuff rate.

DCS TIP: When operating a diesel or electric engine, setting the chuff rate to a value between 1 and 8 will play the corresponding engine rev level.

Menu Operations - Sound

Proto Chuff

Tap to toggle the Proto Chuff sounds on or off. Proto Chuff automatically plays labor of drift chuffing sounds if you are under heavy acceleration or deceleration (steam engines only).

Use of the one-touch Labor/Rev Up - Drift/Rev Down icon on the Alternate Control Screen overrides this menu setting. You will need to re-set it to Auto after exercising manual control.

Cab Chatter

Tap to toggle the cab chatter sounds on or off. Cab Chatter is voices typically heard when engines are stopped and idling. When enabled, Cab Chatter plays at random intervals when the engine is stopped.

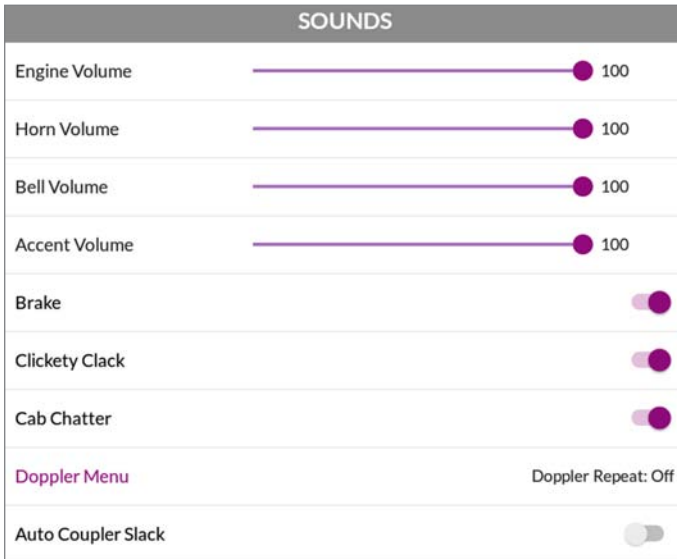
Brakes

When enabled, the Brakes feature triggers the squealing brake sound effect automatically when you slow speed rapidly. Tap to toggle the brake sounds on or off.

Clickity Clack

When enabled, the sound set will automatically play the clickity-clack sounds of wheels on rails when the engine moves at speeds greater than or above 30 smph and maintains the same speed for 30 seconds or more. When you change the speed, the regular engine sounds resume until the clickity clack conditions have again been met. The speed of the sound effect varies with the train's speed. Tap to toggle clickity clack sounds on or off.

Menu Operations - Sound



Auto Coupler

You can now elect to have the coupler slack sounds play automatically every time an engine pulls away from a stop.

1. Press the Settings icon.
2. Under the Sound settings, toggle the Auto Coupler Slack icon on or off.
3. Return to the Main Control screen and ensure the engine has been start-up.
4. Tap the speedometer icon, or use the + icon, to get the engine moving and as soon as it pulls away it will play the Coupler Slack sound.
5. Once the engine goes back to 0sMPH then pulls away at any speed the sound will play again. It will work this way on every DCS engine in your remote until you shut it off.
9. To turn the feature off, repeat steps 1 and 2.

NOTE: This setting is a global setting, so when you make this setting it will affect all engines in the DCS Application.

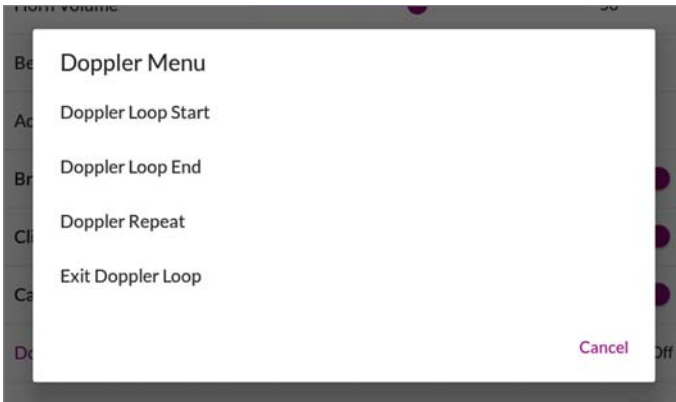
Menu Operations - Sound

Doppler Loop

This feature allows you to set the Doppler effect to play every time the programmed engine passes a certain point on your layout. M.T.H. sound engineers measured this for a scientifically accurate Doppler pitch change: the growing and fading of the sounds are exactly what a scale person would hear as a scale train passed by.

1. Place the engine at the location on the layout where you want the sound to peak during Doppler sound. Tap the Doppler Menu under the Sound settings screen and tap Doppler Loop Start to tell the engine to begin measuring its Doppler loop. Run the engine around the loop.

2. Stop the engine at the exact same location on the layout where you started. Tap the Doppler Menu icon under the Sound Settings screen, then tap Doppler Loop Stop to stop measuring the loop.



3. To operate your Doppler Loop, make sure the engine is where it was when you started, tap Doppler Repeat, and run the engine like normal. The sound effects will fade out as you pull away from the peak spot on your layout and will swell as you round the circle and return to the peak spot. The locomotive will continue to operate in consecutive Doppler cycles until you select Exit Doppler Loop from the Doppler Menu.

NOTE: Because there is no Global Positioning for model trains, the Doppler system measures distance, not location on a layout. You must begin and end your setting and begin operation at the exact same point on the layout, or the mis-measurement will cause the Doppler peak location to move over time. For instance, if you stop programming the loop 5 inches short of where you started, the loop will be five inches short of your layout's full route, and the Doppler peak will move by five inches on every trip around the layout.

Menu Operations - Sound

DCS TIP:

For small layouts:

There may not be enough room for the Doppler effect to fade completely to silence between loops. You can turn down the master volume before running in Doppler mode so that the engine sounds will fade completely.

For very large layouts:

You may have a large enough layout to program Doppler to play the loop more than once as it circles your layout. To do this, divide your track very carefully into even segments (exact halves, thirds, or quarters), and program the Doppler effect to play for only one of those segments. When you operate the train, the sound will play back-to-back as it travels the track.

A large, stylized, light gray number '5' is centered on the page. The number has a thick, rounded font style with a slight shadow effect.

Menu Operation: Control

Menu Operations - Control

Smoke Volume

Adjust the output of the smoke unit.

Go to the Settings Screen and scroll down to the Smoke settings. Tap on the desired smoke level: Low, Medium, or High. Most Proto-Sound 2.0 or later engines have the default set at High. Return to the Main Control screen. It will take a couple of seconds before you see the engine's smoke output change.

CAUTION: Be sure you always have smoke fluid in the engine when running with the smoke unit on at any of the three levels. If you do not have smoke fluid, turn the smoke unit off using the #1 key on the keypad. Check your smoke fluid level frequently when running in MAX mode.

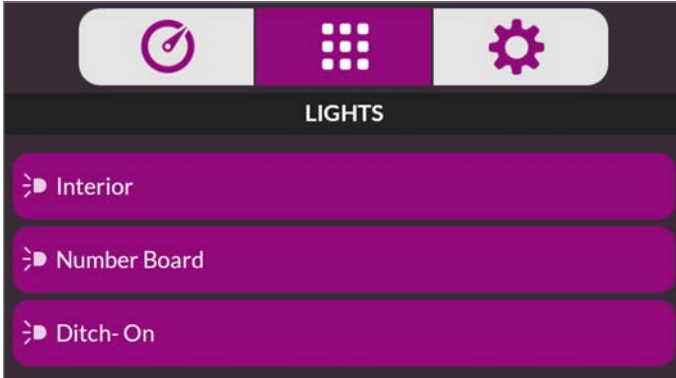


Menu Operations - Control

Ditch Lights

Set the engine's ditch lights to one of four settings. The ditch light control softkey is only found on diesel engines that include this feature.

1. Tap the Softkey Screen icon and scroll down to the lights softkeys.



2. Tap the Ditch Lights icon and tap to select your desired setting:



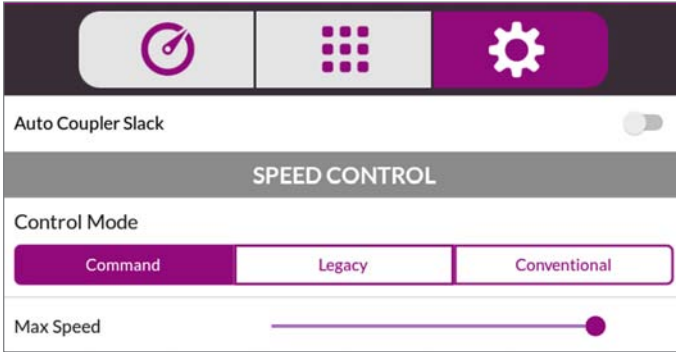
- On: turned on all the time, no flashing
- Auto: turned on, flashing only when you blow the horn
- Flash: flashing all the time
- Off

Menu Operations - Control

Maximum Speed

You can set a maximum engine speed to keep your locomotive from derailing as it races through a tight curve.

1. Tap the Settings Screen icon and scroll down to the Speed Control settings.



2. Tap, hold, and drag the circle on the slider to lower the maximum speed (the default is 120 smph) to the setting you want.

Acceleration Rate

Set your engine to accelerate in different increments, ranging from 1 to 25. The engine's default acceleration rate is set low, but you can set the engine to accelerate much more quickly as you scroll the thumbwheel. Set the rate low to avoid derailing a long train of freight cars, or set it high to keep up with the large speed steps in other manufacturers' engines.

1. Tap the Settings Screen icon and scroll down to the Speed Control settings.
2. Tap, hold, and drag the circle on the slider to set the acceleration rate you want



Deceleration Rate

Set your engine to decelerate in different increments, ranging from 1 to 25. The engine's default deceleration rate is set low, but you can set the engine to decelerate much more quickly as you scroll the thumbwheel. Set the rate low to avoid derailing a long train of freight cars, or set it high to keep up with the large speed steps in other manufacturers' engines.

1. Tap the Settings Screen icon and scroll down to the Speed Control settings.
2. Tap, hold, and drag the circle on the slider to select the deceleration rate you want.

Menu Operations - Control

Direction Control

Lock an engine into a direction by changing the direction cycle. Rather than the default Forward/Reverse (F/R) cycle, you can set it for a Forward or Reverse cycle. Remember, in command mode there is no neutral.



Tap the direction cycle you want.

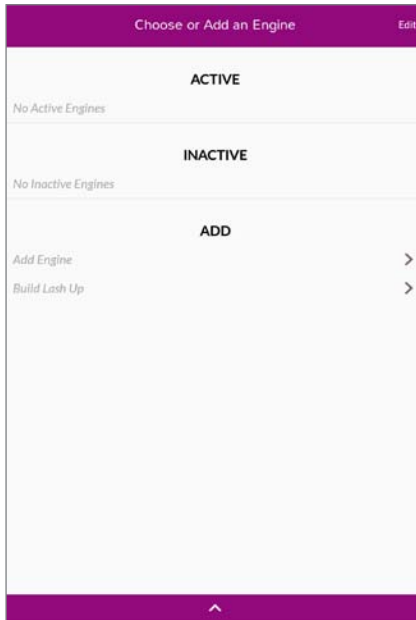
A large, light gray, stylized number '6' is centered on a dark gray background. The number is composed of a thick, curved stroke that forms the top and right side, and a smaller, rounded stroke that forms the bottom and left side, creating a central negative space.

**Menu Operation:
Systems**

Menu Operations - Systems

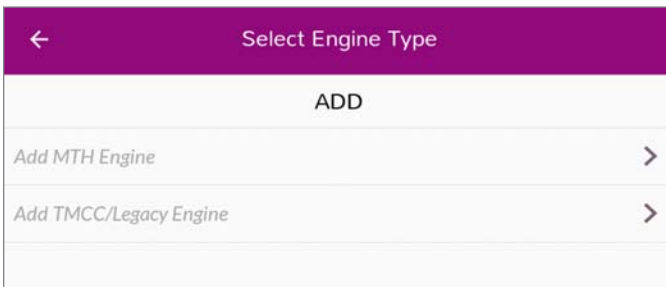
Engine List Screen

On the **Main Control Screen**, tapping **Choose or Add an Engine** or the down arrow, takes you to the **Engine List Screen**. This screen is used to manage your engine roster. From here, engines can be added or deleted. You can also see the list of currently active and inactive engines.



Add Engine

Add M.T.H. Engine



Tap **Add MTH Engine** and follow the prompts to add a new engine to your system. Wait until the window says the engine was found and returns to the engine screen addressing that engine. Because M.T.H. features the SmartRead system, your engine tells the TIU its name and you do not need to enter any information in order to add the engine.

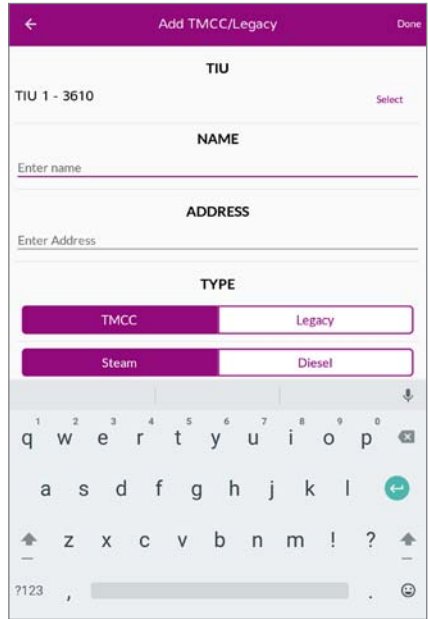
Menu Operations - Systems

If you want to add additional engines, remove the previously added engine from the track, place the new engine on the track, and Add MTH Engine. You need to complete these steps only once per engine/DCS Application, when you first add it to your system, not each time you place a previously added engine on the track.

NOTE: Engines should be added to your system one at a time. Never try to add multiple engines that have the same address!

Add TMCC Engine

1. The App prompts you to **Select a TIU**.
2. Tap on **Enter Name** and an alphanumeric character set is displayed. Type in a name for your engine.



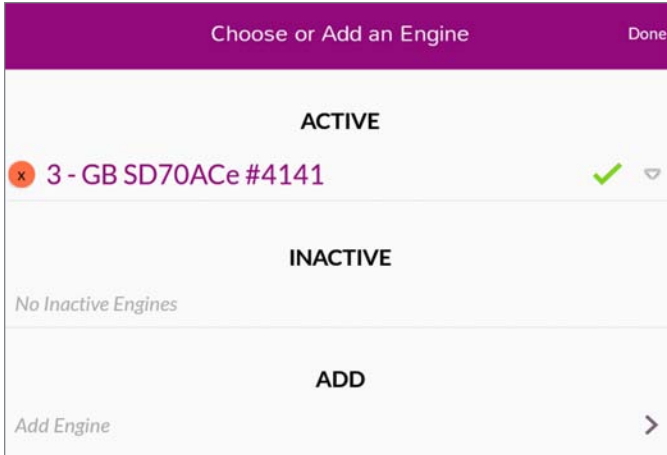
3. Next, enter the TIU Address that is connected to the TMCC Command Base.
4. DCS automatically assigns the engine to a place in the engine list and takes you to the engine screen.

NOTE: Engines are stored in the DCS Application's memory, so if you want to run the same engine with multiple DCS Applications, you must add that engine to each DCS Application that will be used to control it.

Menu Operations - Systems

Delete Engine

1. Tap on **Edit** at the top of the **Engine List Screen**. A red circle X will appear next to the engine names. Tap on the red circle next to the engine you wish to delete. The engine will disappear from the engine list.



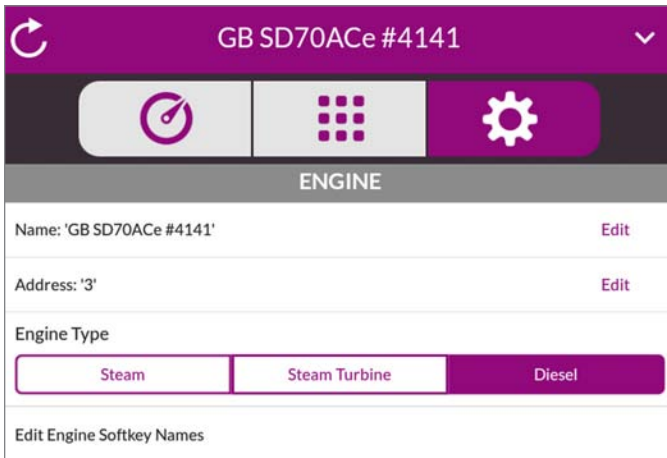
2. Tap **Done** to confirm your changes.

DCS TIP: If you wish to delete an entire Lash-up, do it as though you were deleting a single engine.

Menu Operations - Systems

Edit Engine

Each Proto-Sound 2.0 or later engine comes with a pre-assigned engine name (such as M10000) and is added to the engine list in order, but you can choose to rename or renumber the engines if you choose. For instance, if you have two of the same engine type or run at a Club where other members have the same engine, you can rename them to distinguish one from the other.



Edit Name

1. From the **Main Control Screen**, tap on the **Settings Screen** icon.
2. Tap **Edit** to the right of the engine name. An alphanumeric character set is displayed. Type in the new engine name and then tap **Save**.

NOTE: Once you begin to change an engine name via the character set, aborting the process will leave the original name still intact.

Edit Engine Address

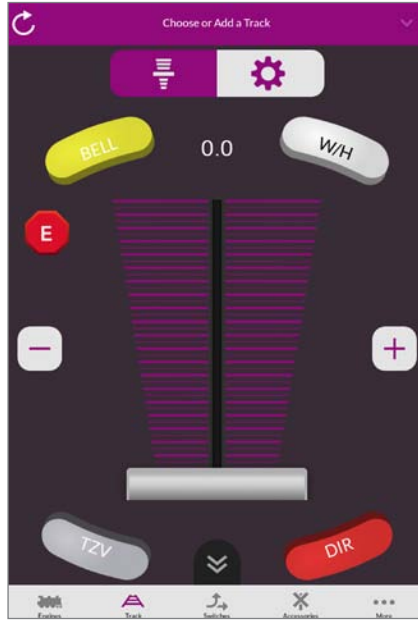
1. From the **Main Control Screen**, tap on the **Settings Screen** icon.
2. Tap **Edit** to the right of the address name. Scroll to an engine address/number that you have not already assigned to another engine (the LCD will show only numbers that are not currently occupied). Tap the number to select it and then tap **Save**.

NOTE: Editing an engine's address will cause the DCS system to delete all lash-ups associated with the engine.

Menu Operations - Systems

Track Setup

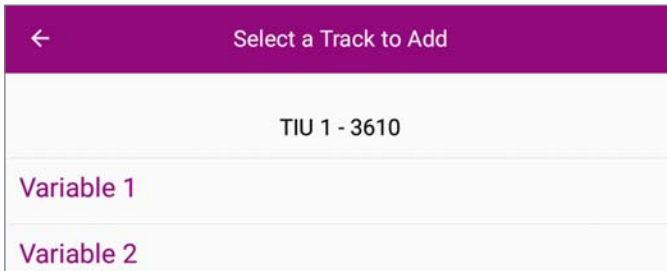
The **Track Control Screen** is used to manage conventional mode tracks that can be controlled via the DCS Application. The DCS system automatically assigns track addresses to the tracks wired to Variable channels 1 and 2 of TIU 1. You must enter and address Variable channel tracks from additional TIUs and Fixed channel tracks (controlled by a Z-4000 remote receiver) from any TIU manually, as described below.



Add Track

Add TIU Track (use for tracks wired via Variable channels only)

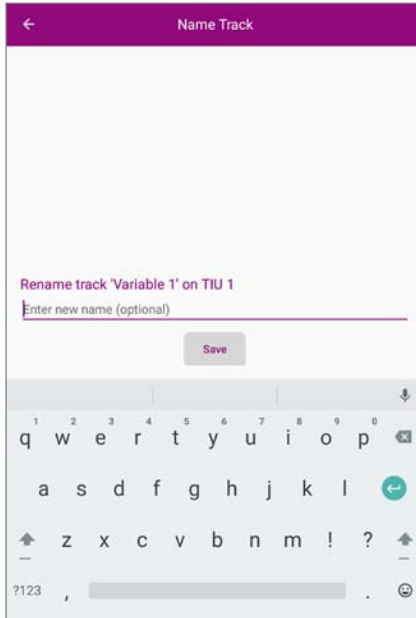
1. Tap on **Choose or Add a Track** from the **Track Control Screen**.
2. Tap **Add Track** and select the track you want to add. **NOTE:** TIU 1-5 — there is no need to complete this step if you are using only one TIU; the system enters these tracks automatically.



Menu Operations - Systems

For instructions on running a conventional mode engine on a Variable track, please see the “Universal Locomotive Control: Conventional Mode” section of the “Universal Locomotive and Accessory Operation” chapter.

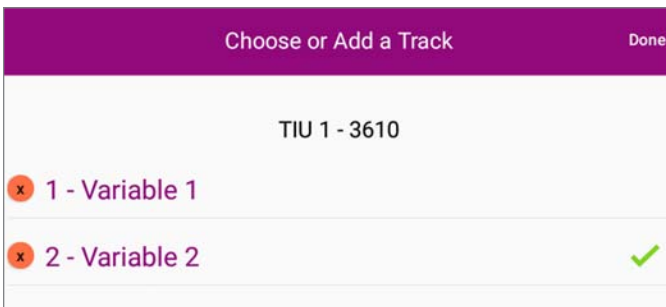
3. The App prompts you to name the track, and an alphanumeric character set is displayed. Click **Save** to signify that you are done with this step.



Delete Track

1. Tap on the **down arrow** icon from the **Track Control Screen** to get to the track list.

1. Tap on **Edit** at the top of the **Track List Screen**. A red circle X will appear next to the track names. Tap on the red circle next to the track you wish to delete. The track will disappear from the list.

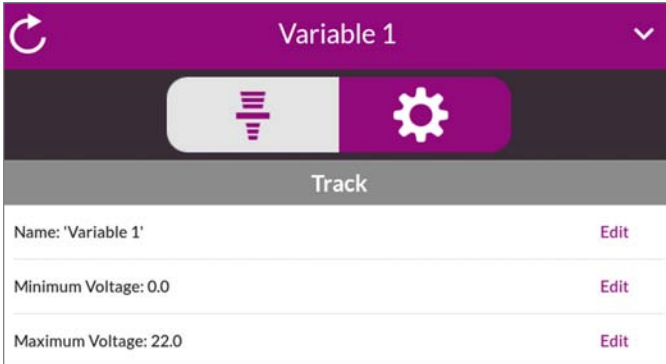


Menu Operations - Systems

Edit Track

Track Name

1. Tap on the **Track Settings** icon.



2. Tap **Edit** and an alphanumeric character set is displayed. You may give the track a name up to 16 characters long. Tap **Save** to signify that you are done with this step.



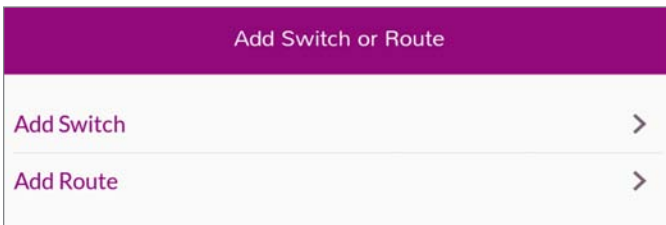
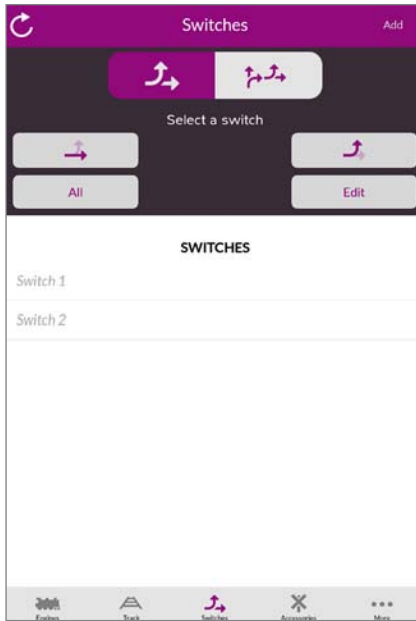
Menu Operations - Systems

Switch Setup

This menu is used to manage switches (turnouts) that can be controlled via the DCS Application. An AIU (Accessory Interface Unit, Item No. 50-1004) is required for remote control of switches.

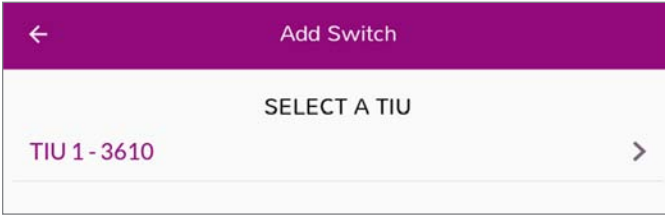
Add Switch

1. Wire the switch into the AIU as shown in the AIU user's manual and your track's instructions.
2. Tap on the **Add** icon at the top of the screen and then tap **Add Switch**.

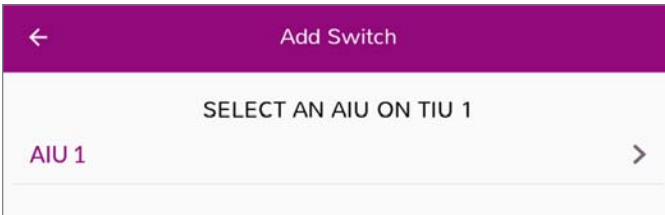


Menu Operations - Systems

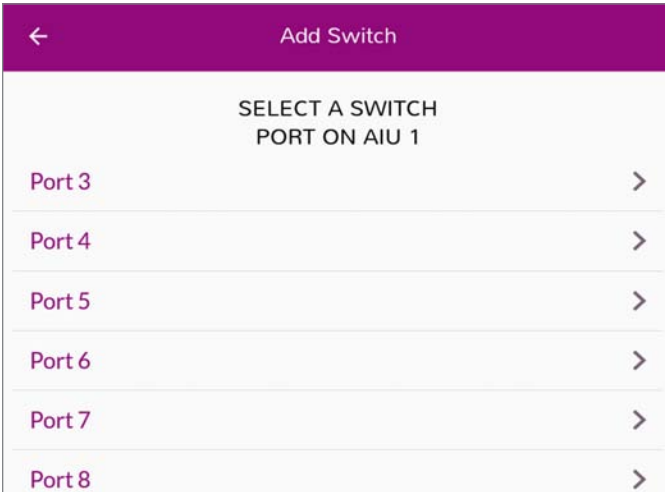
3. Select which TIU (if you are using more than one), and the previously connected AIU, to which the switch is added to.



3. Select which AIU the switch is added to. To determine the AIU's number, simply count out from the TIU. For instance, if you have three AIUs, the one connected directly to the TIU is AIU1, the one connected directly to AIU1 is AIU2, and the one connected directly to AIU2 is AIU3.)

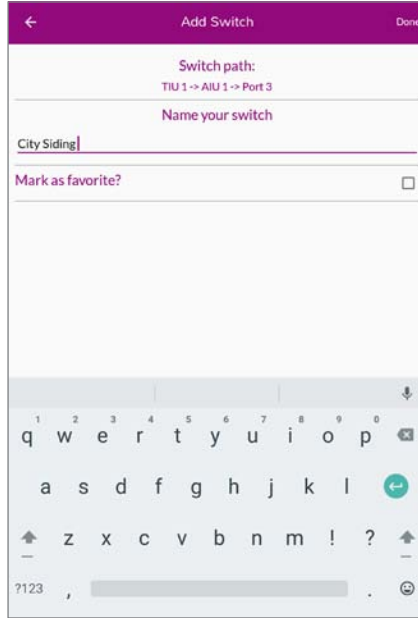


4. Select the AIU port (SW1-SW10) the switch is wired into.



Menu Operations - Systems

5. The App prompts you to name the switch, and an alphanumeric character set is displayed. Click **Save** to signify that you are done with this step.



Edit Switch

Switch Name

1. The complete list of switches (for all TIUs and AIUs) appears on the Switch Screen. Tap on the one you want to rename and then tap the Edit icon.
2. An alphanumeric character set is displayed. Rename the switch and tap **Done** to signify that you are done with this step.

Switch Path

If you change the TIU or AIU a particular accessory is wired to (for instance if you add TIUs and AIUs as a layout expands), you must tell the DCS system its new path. The DCS System will activate whichever switch is wired into the path listed, whether it is the original switch or not.

1. Wire the switch into the new AIU port.
2. Go to the Switch screen where the complete list of switches (for all TIUs and AIUs) ap-

Menu Operations - Systems

pears. Tap on the name of the one you want to re-path.

3. Select which TIU the switch is added to.
4. Select which AIU the switch is added to.
5. Select the AIU port (SW1-SW10) the switch is wired into.

Naming Tip: Because you may have several switches and accessories of the same type (multiple O-72 switches, several block signals, etc.), you should choose their names carefully. Otherwise, you might not be able to distinguish one from the other in the heat of operations. Try naming them for landmarks that are near them on the layout or for the corner of the train room they are nearest. “Diner switch” for a switch by Mel’s Diner will be far easier to recognize on the fly than “O-72 no 3.”

Delete Switch

1. Tap the name of the switch you want to delete and tap **Edit**.
2. Tap **Delete switch** on the **Edit Switch** screen. A pop-up screen will ask you to confirm or cancel.

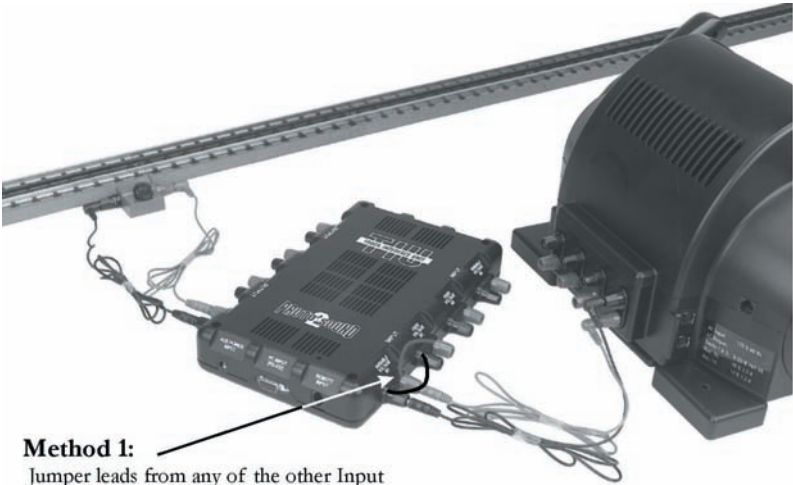


Advanced Wiring

Advanced Wiring

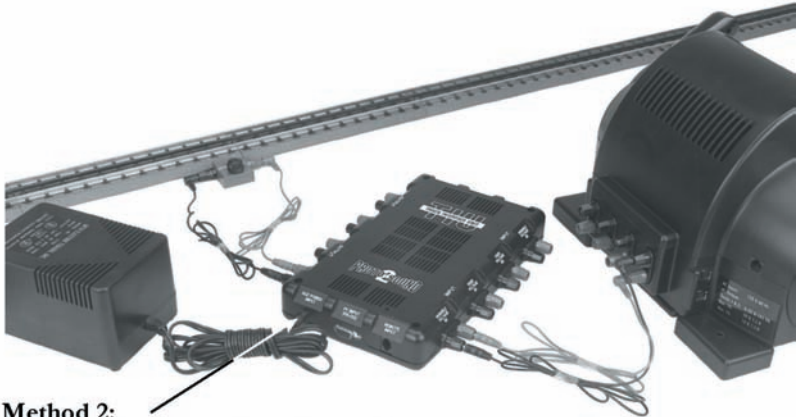
Wiring Through a Variable Channel Only

In order for the TIU to function, Fixed In 1 must be connected to the transformer. If Fixed In 1 is not required because Fixed Out 1 is not connected to any track, two additional methods are available for powering the TIU.



Method 1:

Jumper leads from any of the other Input ports to Fixed In 1 As shown.

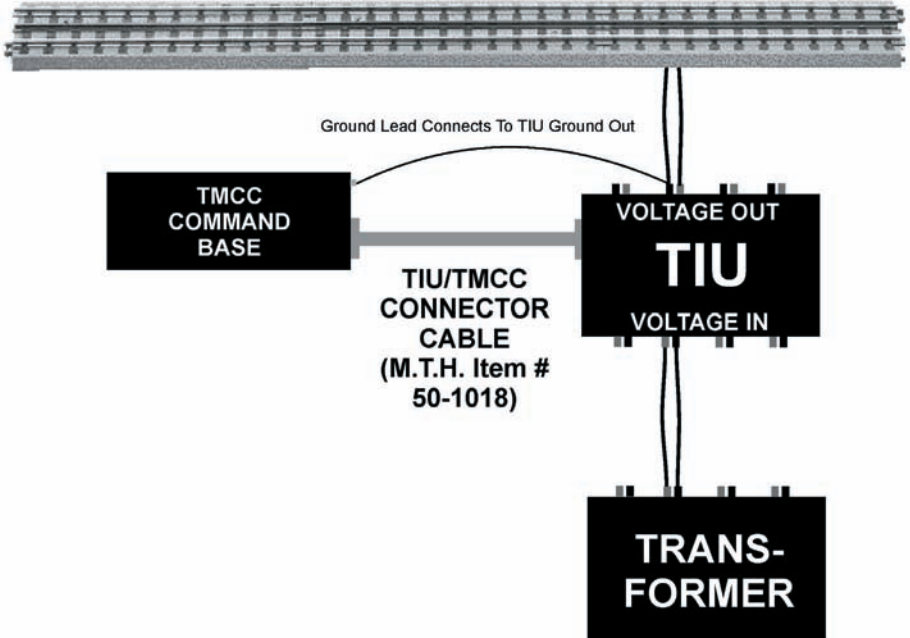


Method 2:

Plug a separate power supply into the Aux Power Input connector on the TIU. We recommend MTH Z-500, Z-750,Z-1000 power supplies found in RailKing train sets and sold separately (MTH Item Number 40-500 , 40-750, 40-1000). Alternate power supplies must be within 12 to 24 Vac and 1.0 to 10 Amps.

Advanced Wiring

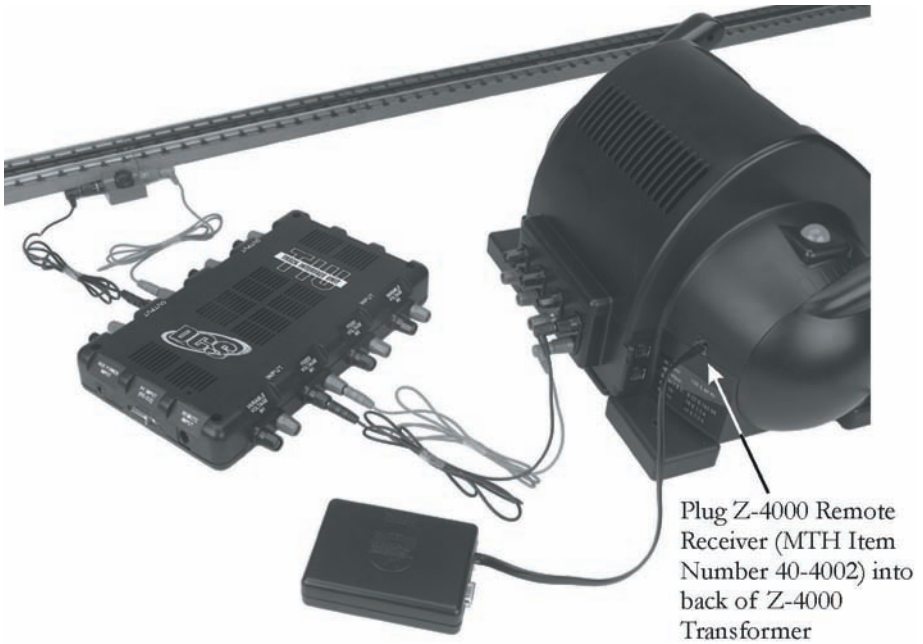
Connecting the TMCC Command Base to a DCS Layout



NOTE: While the TIU/TMCC Connector Cable (Item No. 50-1018) looks like a standard computer DB-9 cable, two of the pins have been reversed to allow the TIU and Command Base to communicate. A standard DB-9 cable will not work in this application.

Advanced Wiring

Wiring with Z-4000 Remote Receiver for Conventional Control of Fixed Channels



Advanced Wiring

One of the great features of the DCS system is that it is expandable and can be adapted to each layout. The installation of the system to each layout may differ as the size and complexity of the layout increase. Here are some general guidelines for installing DCS on larger more complex layouts. Please see MTH's website, www.protosound2.com, for more articles on layout wiring.

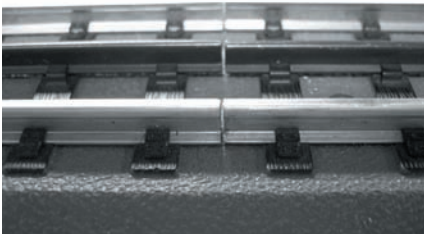
Multiple TIU Channels/Multiple TIUs

Depending on the size of your layout, you may need to use more than one TIU channel. If your layout contains more than 300 feet of track and wiring or more than 5 engines on the track at one time, MTH recommends using more than one TIU channel to maintain a good DCS Track Signal (see System/Track Signal Test for more information). If you are running engines in Command Mode only, remember the TIU Variable Channels can be set to Fixed (see Menu/System/DCS Set Up) and all 4 channels of the TIU can be used (AC power only). For layouts with more than 1200 feet of track and wire, MTH recommends using multiple TIUs set to SUPER MODE to maintain a good DCS Track Signal. It is important to understand the DCS remote sends a command to one TIU or multiple TIUs at the same time and the digital command for one locomotive is sent to all tracks connected to all TIU channels simultaneously. Therefore, the train will receive the digital command wherever it is on the layout provided that section of the layout is connected to a powered TIU. It is also important to remember the DCS Remote can send commands to one TIU or multiple TIUs depending on the TIU addresses you instruct the DCS Remote to communicate with (see Menu/System/TIU Set Up/Add TIU).

Wire Management/Track Blocks

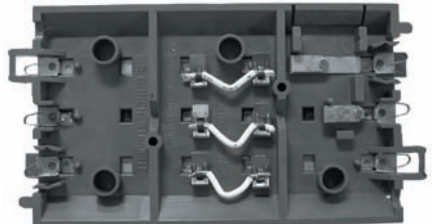
Since DCS puts the digital signal on the center rail, digital signal strength may become an issue as the track and wire length increase. When more than one TIU channel is used, the track should be separated into blocks. This is easily done by insulating the rails between blocks. In addition, the wire lengths on a terminal strip should be balanced; the length of wire should be the same wherever possible to maximize the DCS signal on the track. Therefore, placement of the TIU and Terminal Blocks should be centralized to minimize the wire length going to the track.

Top View (40-1029)



Bottom View (40-1029)

Remove Wire to insulate center rail.



Advanced Wiring

Conventional, Command, or Both

If you plan to run trains in conventional and command mode on the track at the same time you will need to use a Variable channel of the TIU. Using the Variable channel of the TIU, you can run conventional engines (vary the voltage to the track) and command engines (send digital commands) on the track at the same time to vary the speed of the engine for example. It is important to remember that the top speed of the command train will be limited to the voltage on the track.

NOTE: The variable channels require 22 volts AC power at the Variable Input to provide the voltage displayed on the DCS Remote. If less than 22 Volts AC is provided to the Variable Input the voltage output to the track will be less than that displayed in the DCS Remote. The TIU Variable Channel will NOT vary DC power.

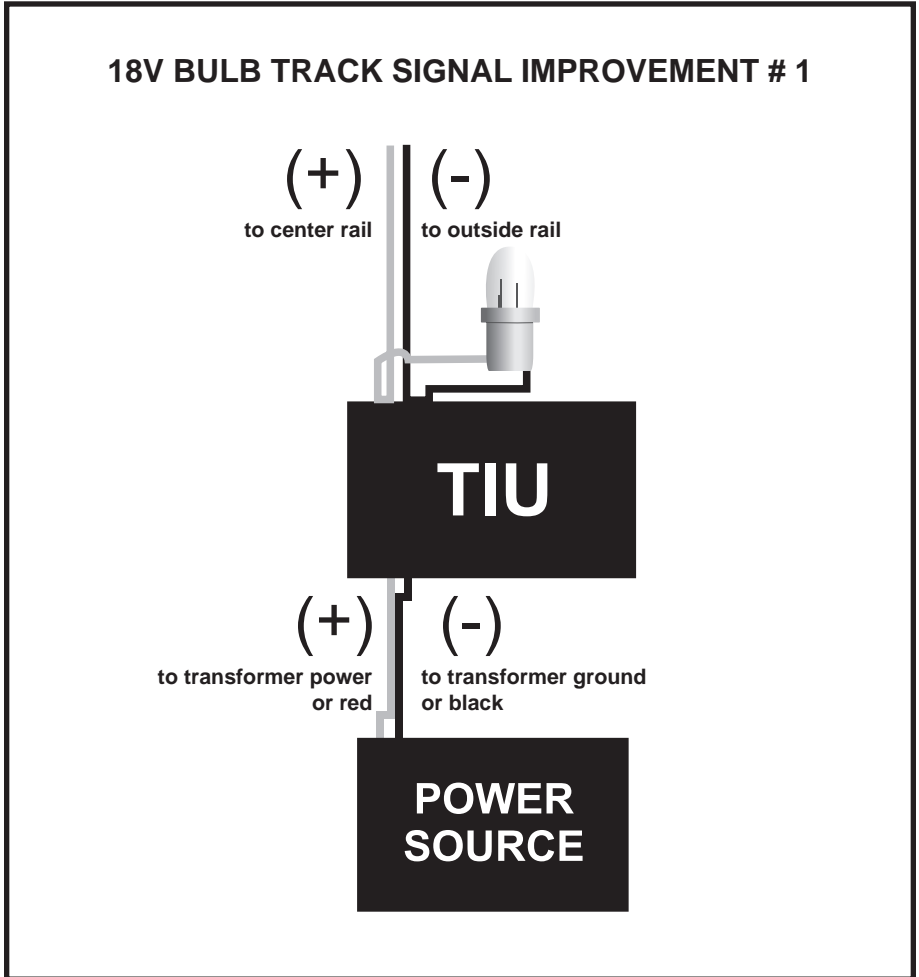
Using DC Power Supplies

It is important to remember the DCS system was designed for inside layouts. If DCS is used outdoors on One gauge or (G gauge) layouts, please make sure the system is protected from the weather (rain and snow for example). In addition, DC power will NOT pass through the TIU Variable Channels. Therefore, use only the Fixed 1 & 2 Channels with DC power supplies. Also remember the polarity is critical to DCS Command operation. The positive (+) rail carries the digital signal. You may have to place the engine on the track in the opposite direction if the engine does not have a polarity switch. It is also very important to keep in mind the positive output (+) from the DC power supply must be connected to the positive (+) input terminal on the TIU Fixed channel to carry the DCS signal to the track.

Advanced Wiring

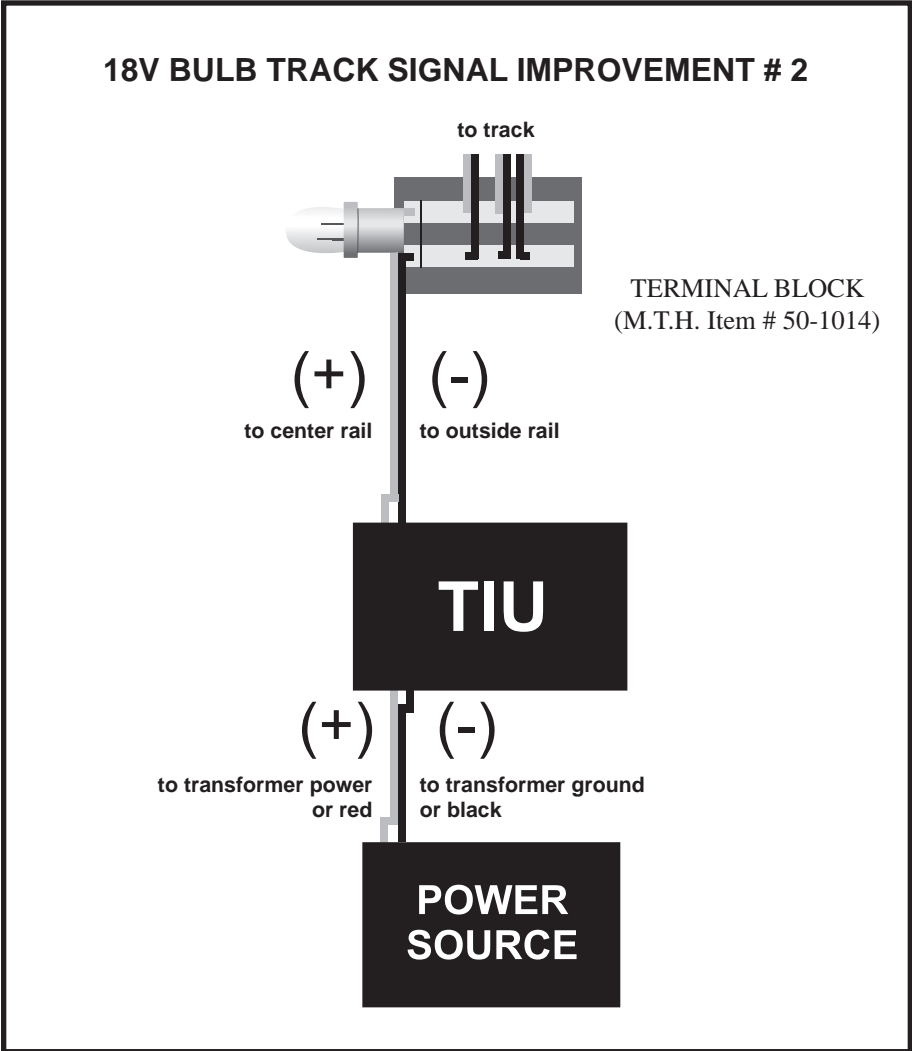
Track Signal Improvements

A simple method has been discovered that improves DCS track signal quality on layouts wired according to the MTH DCS wiring recommendations. The method can be employed on any layout where track quality fails to exceed 8 when measured using the DCS Track Quality test found in DCS's remote control features.



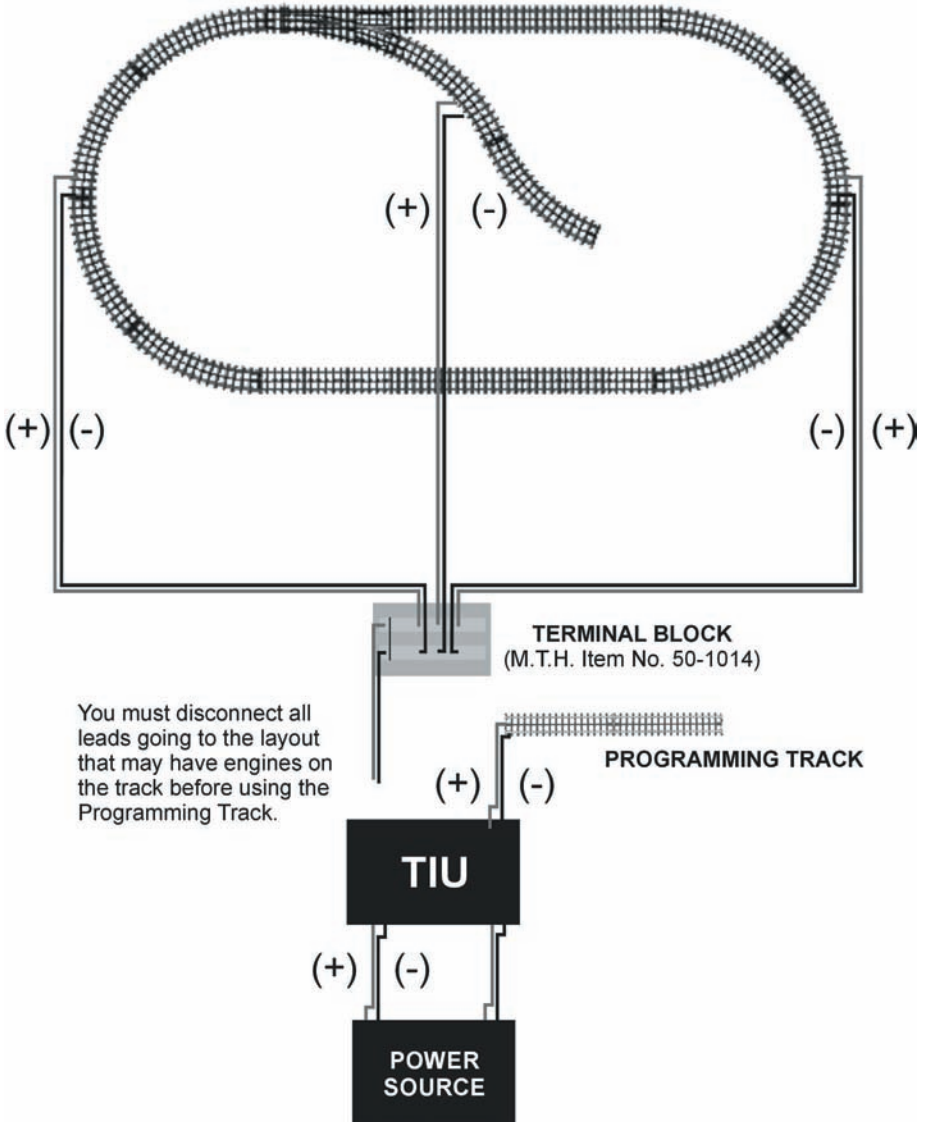
Advanced Wiring

By attaching an 18 volt bulb to the output ports (red and black) of the TIU Output Channels (Fixed or Variable) or onto the DCS Terminal Block input ports (red and black), the track signal quality measurements will increase. The solution does not boost the signal it simply cleans up signals reflected back into the TIU from the track. In effect, the solution eliminates any “noise” caused by signals already present on the layout which lower the effectiveness of any new signal produced by the TIU as commands are sent out.



Advanced Wiring

Setting up a Programming Track



APPENDIX

FAQ

Frequently Asked Questions

Do I have to have an M.T.H. Z-4000™ to use DCS?

No. DCS and Proto-Sound 2.0 or later, whether in Command or Conventional Mode, will work with most UL-approved, AC hobby transformers, including any M.T.H. transformer, the Lionel® ZW, and others. We do caution you not to use homemade transformers or Right-Of-Way™ transformers that are not UL-rated and have power outputs in excess of 190 watts, as these may damage system components. Use of older transformers, like the postwar Lionel ZW is acceptable provided those transformers are used in conjunction with inline fuse protection as described in Chapter 1 of this manual.

What are the maximum power ratings of the DCS Application System?

The TIU channels are designed to handle up to 12 amps and 190 watts each. This is the maximum allowed by UL regulations, which we are careful to follow. Our system is fully compatible with all UL-approved AC hobby power supplies.

What is the effect of full voltage on the lights in M.T.H. switch stands and passenger cars?

The bulbs used in the switches are rated at 18v. They can operate at slightly higher voltages, but continuous operation at higher voltages (20-25v) will reduce the average life of the bulb and generate a lot of heat.

MTH took the precautions of ensuring that our passenger cars bulbs would work at high constant voltages some time ago. Most passenger car bulbs are rated at 18 volts and so will have full lives running at constant 18v loads or less; others are rated at 14 volts, so will have slightly shortened lives if running at constant voltages higher than that. All passenger cars bulbs made in the last few years have been protected against overheating in a high constant voltage environment.

This system is so complex, isn't it hard to set up?

No. Your Proto-Sound 2.0 or later-equipped engines are ready to operate in Conventional Mode right out of the box with no additional equipment. As soon as you put the locomotive on the track and power up the transformer, you will hear the engine come to life.

The separately sold Track and Accessory Interface Units (TIU and AIU) for Command Mode are easy to connect ([link to Connection Diagram](#)) and allow you to control multiple locomotives and track switches and accessories with a single DCS Application.

FAQ

Does Proto-Sound 2.0 or later with DCS really allow me to control Lionel® Trainmaster® engines?

Yes. Proto-Sound 2.0 or later with DCS is the first train control system on the O Gauge market that allows individual control over TMCC and Proto-Sound 2.0 or later engines on the same track at the same time. When you connect a Lionel® Command Base into the DCS TIU you can operate DCS locomotives in Command Mode, Trainmaster® locomotives in Command Mode, and Conventional locomotives on the same track at the same time, all with a single DCS Application.

That does not, however, mean that new features, such as Proto-Speed Control, will function in non-Proto-Sound 2.0 or later engines that are being operated by our DCS Application. You will be able to use only the features that are included in each individual locomotive.

The system will control other manufacturers' conventional locomotives and sounds without requiring additional equipment.

If I want to run conventional and DCS command mode locomotives on the same track, what limitations will I have?

The speed on all the locomotives is limited to the setting you use for the Conventional locomotive's speed. For example, if you choose to run the Conventional locomotives slowly and set the transformer for 10 volts, that is all the power that will be available to the Command engine, limiting its speed as well.

Can I retrofit my original Proto-Sound locomotives with the new system?

A Proto-Sound 2.0 or later upgrade kit has been created for older M.T.H. and non-M.T.H. steam and diesel locomotives and can be purchased directly from the company's website or through an M.T.H. Authorized Retailer. Each kit consists of a Proto-Sound 2.0 or later circuit board, a coil wound Proto-Coupler, various wire harnesses, new speaker, new rechargeable batteries, new mounting brackets, and headlight and backup light bulbs. The kits are warranted for 90 days when installed by a participating M.T.H. Authorized Service Center. Each kit will require programming of a sound set prior to operation. The sound sets can be downloaded from the M.T.H. website at no charge but will require the DCS system in order to be uploaded into the upgraded locomotive.

Virtually all features found in factory equipped Proto-Sound 2.0 or later locomotives are included in the Proto-Sound 2.0 or later Upgrade Kit. These include conventional and command mode Proto Speed Control, full Ps2 digital sound effects, DCS command features, conventional and command mode Proto-Coupler operation, conventional and command mode synchronized puffing smoke on locomotives equipped with fan driven M.T.H. smoke units, self recharging battery backup system and operating headlight control.

FAQ

Can I use a Z-500 or Z-750 power supply to power the TIU through the Auxiliary Power port?

Yes, but keep in mind that when the power supplies are plugged into the auxiliary power port, they are only providing power to the TIU, they are not sending power out to the track.

How can I update to the latest DCS software?

DCS updates are available online for free.

For more information please visit our website at:

<http://www.protosound2.com/>

When I update the DCS Software, do I have to have the most recent version in my system prior to installing the upgrade?

No, each DCS software version is complete by itself. You can install version 2.2 on top of version 2.0 with no ill effects.

What happens if you don't hit the startup button prior to running a locomotive?

Nothing, the locomotive will simply move ahead without any locomotive sounds.

Can I use one transformer channel to power two different TIU channels?

Yes, but such a configuration will severely limit the available power for each of the channels. When possible, use separate transformer channels or transformers for each TIU channel.

What happens if I wish to add two of the same locomotives into the App?

DCS allows you to add multiple locomotives of the same type and roadname. The system automatically creates separate ID numbers for each engine. The user can then rename each engine (possibly with cab numbers or the owner's name) to avoid any subsequent confusion.

If I turn off the smoke switch on my locomotive, does that turn off the smoke feature when activated by the DCS remote?

No, the DCS system overrides the manual smoke unit switch on the locomotive.

Glossary

AIU: Accessory Interface Unit. Unit that receives digital command signals from a TIU for remote accessory and switch (turnout) control.

Banana Plug: Male plug with bowed slats. Tension in the slats creates force that holds banana plug in place within a banana jack (female plug).

Command Mode: Mode of operation in which digital signals, as opposed to track voltage changes, control engines. Track voltage is constant (usually set ~18V). Command Mode operation controls an individual engine or engines as opposed to controlling all engines on a given track.

Conventional Mode: Mode of operation in which track voltage changes (including short DC offset signals) control a track. In conventional mode operation, all engines on a given track are controlled simultaneously.

DCS: Digital Command System. System of one or more Proto-Sound 2.0 or later engines, DCS Application, TIU, AIU (optional), operating software, and the protocols by which they communicate.

Engine Address: In DCS, numerical assignment given to each engine or consist. When DCS engines are added to the system, they are assigned to the next available position in the engine list. The Engine Address number (and not the alphabetical or alphanumeric engine name) is the means by which the DCS system distinguishes between DCS engines.

Engine Name: In DCS, alphabetical name given to each engine. Each DCS model type is factory-programmed with a different Engine Name (e.g. all RailKing GG-1's are named "RK GG-1"). Engine Name may be reprogrammed up to 16 characters (as would be desired to distinguish between multiple engines of the same type operating on the same DCS system).

Fixed Voltage: In both "FIXED VOLTAGE/IN 1" and "FIXED VOLTAGE/IN2" channels of the TIU, 'FIXED VOLTAGE' means that the input voltage to the TIU channel = output voltage from the TIU channel. For example, the voltage into "FIXED VOLTAGE IN2" channel terminals will always be equal to the voltage out of "FIXED (DCS) OUT2" channel terminals.

Legacy Mode: DCS feature that turns off speed control on PS-2 engines.

RJ-11: Designation for 4-conductor (wire) "telephone" type plug and socket. Used in DCS system for fixed tether between DCS remote and TIU.

RJ-12: Designation for 6-conductor (wire) "telephone" type plug and socket. Used in DCS system for connecting TIU to AIU and AIU to AIU. Each AIU purchase includes one RJ-12 cable.

Glossary

SMPH: Scale Miles Per Hour. Scale representation of actual speed as a proportion relative to a model's size. O-gauge DCS models (including RailKing traditionally sized models) are calibrated to operate at 1/48 prototypical speeds. RailKing 1-Gauge and Standard gauge DCS models are calibrated to operate at 1/32 prototypical speeds. For example, a RailKing GS-2 running at 48 scale Miles Per Hour (sMPH) moves at 1 actual Mile Per Hour (MPH).

Speed Control: DCS feature by which engine speed is regulated by track voltage (Conventional Mode) or digital signal (Command Mode). Speed Control eliminates variations in engine speed due to grade changes, applied load (consist length, weight & inertia) or curves.

TIU: Track Interface Unit. Unit that receives and transmits DCS command signals to and from DCS remote (or PC) and DCS engines.

TMCC: TrainMaster Command Control. Available in some O Gauge engines allowing those engines to be run in command mode via the DCS system.

Track Address: Numerical Address assigned to each track. May be reprogrammed as desired via `MENUSYSTEMTRACK ADDRESS`. A track is defined as whatever is connected to a single TIU channel. This could in fact be a loop of track or simply an insulated block.

Track Name: Alphanumeric name assigned to each track. May be reprogrammed as desired via `MENUSYSTEMTRACK NAME`. A track is defined as whatever is connected to a single TIU channel. This could in fact be a loop of track or simply an insulated block.

Variable Voltage: In both "VARIABLE VOLTAGE IN1" and "VARIABLE VOLTAGE IN2" channels of the TIU, 'VARIABLE VOLTAGE' means that the TIU adjusts (controls) the output voltage as per the signal sent via the DCS remote. The VARIABLE VOLTAGE channels of the TIU are necessary for Conventional Mode operation of DCS engines on DCS-equipped layouts and for operation of non-command control (DCS or TMCC®) engines, but may also be used for DCS Command Mode operation.

Service & Warranty Information

How to Get Service Under the Terms of the Limited One-Year Warranty

When you suspect an item is defective, please check the operator's manual for standard operation and trouble-shooting techniques that may correct the problem. Additional information may be found on the M.T.H. Website. Should you still require service, follow the instructions below to obtain warranty service.

First, e-mail, write, call or fax a M.T.H. Authorized Service Center (ASC) in your area to obtain Repair Authorization. You can find the list of ASCs on the M.T.H. Website, www.mthtrains.com. Authorized Service Centers are required to make warranty repairs on items sold only from that store; all other repairs may-- or may not be done at the store's own discretion. If you did not purchase the item directly from the ASC, you will need to select a National Authorized Service Center (NASC). These centers are compensated by M.T.H. to perform warranty service for any customer whose repair qualifies for warranty service. A list of NASC retailers can be located on the M.T.H. Website or by calling 410-381-2580. Should the warranty no longer apply, you may choose either an ASC or NASC retailer to service your M.T.H. Product. A reasonable service fee will be charged.

CAUTION: Make sure the product is packed in its original factory packaging including its foam and plastic wrapping material to prevent damage to the merchandise. There is no need to return the entire set if only one of the components is in need of repair unless otherwise instructed by the Service Center. The shipment must be prepaid and we recommend that it be insured. A cover letter including your name, address, daytime phone number, e-mail address (if available), Return Authorization number (if required by the service center, a copy of your sales receipt and a full description of the problem must be included to facilitate the repairs. Please include the description regardless of whether you discussed the problem with a service technician when contacting the Service Center for your Return Authorization.

Please make sure you have followed the instructions carefully before returning any merchandise for service. Authorized M.T.H. Service Centers are independently owned and operated and are not agents or representatives of M.T.H. Electric Trains. M.T.H. assumes no responsibility, financial or otherwise, for material left in their possession, or work done, by privately owned M.T.H. Authorized Service Centers.

If you need assistance at any time email MTH Service at service@mth-railking.com, or call 410 381-2580.

Limited One-Year Warranty

All M.T.H. products purchased from an M.T.H. Authorized Retailer are covered by this warranty provided the product was manufactured within five years of the date of purchase. This warranty is for the original purchaser and is non-transferable.

See our website www.mthtrains.com to identify an M.T.H. Authorized Retailer near you.

M.T.H. products may be registered online in advance of warranty work at www.mthtrains.com/warranty. The original sales receipt and the conditions below must be met regardless of whether the product is registered on the M.T.H. website in order to obtain warranty service.

M.T.H. products manufactured within five years from the date of purchase are warranted for one year against defects in material or workmanship, excluding wear items such as light bulbs, pick-up rollers, batteries, smoke unit wicks, and traction tires. We will repair, replace, or credit (at our option) the defective part without charge for the parts or labor if the following conditions are met: (1) the item is returned to an M.T.H. Authorized Service Center* (ASC) or M.T.H. National Authorized Service Center (NASC) or M.T.H. Electric Trains Service Department, (2) was manufactured within the previous five years and (3) was purchased within one year of the original date of purchase from an M.T.H. Authorized Retailer. Products manufactured after the five year cutoff from the date of purchase are not covered under any warranty by M.T.H. Electric Trains. The manufacture date of an item can be verified on the item's detail page "shipping date field" on the M.T.H. website (www.mthtrains.com). This warranty does not cover damages caused by improper care, handling, or use. Transportation costs incurred by the customer are not covered under this warranty.

Items sent for repair must be accompanied by a return authorization number, a description of the problem, and a **copy of the original sales receipt from an M.T.H. Authorized Retailer**, which gives the date of purchase. If you are sending this product to an Authorized Service Center, contact that Center for their return authorization.

This warranty gives you specific legal rights, and you may have other rights that vary from state to state. Specific questions regarding the warranty may be forwarded to M.T.H. Directly.

* Authorized Service Centers (ASC) are only obligated to provide warranty service for any consumer who has purchased the specific M.T.H. item from them that requires service work.

Service Department:
M.T.H. Electric Trains
7020 Columbia Gateway Drive
Columbia, MD 21046-1532