

You're In Control

Introducing the Base3 and Cab3 APP

Necessity is the mother of invention. The ever-growing list of trains offered by Lionel has allowed for user flexibility from the most basic of operating controls in the LionChief category to the legendary advanced features of a Legacy locomotive. This broad range of engine control types has left a ravine when it comes to having a single hand-held controller to operate a model railroad. That is until now.

Symbolically modeled after the Hell Gate Bridge in New York City, the new Lionel Base3 bridges the gap between all Lionel control system types. Legacy, TMCC, and LionChief+2.0 engines are now joined by LionChief, LionChief+, and FlyerChief engines (both Bluetooth and RF varieties) in being controlled from a single controller. The Base3 is compatible with the Legacy Cab2 or Cab-1L hardware remotes, or the all-new Cab3 APP for Android or Apple smart devices.

The Base3 and Cab3 APP features many new innovations that allow you to fully connect with your world of Lionel model trains.

Introducing Lionel's Cab3 & Base3 System

Base3 Features

This revolutionary command base brings control of all Lionel engine command types to a single controller of your choosing.

- Your choice of controller:
 - Built-in [Wi-Fi](#) for full Base3 functionality with the Cab3 APP
 - Compatible with the Cab2 or Cab-1L remotes
- Control [4-digit addressing](#)-compatible locomotives using the Base3 and the Cab3 APP!
- Control Lionel Legacy, TMCC, and LionChief+2.0 engines through the Base3's Legacy radio
- Control [Lionel Bluetooth](#) LionChief+, LionChief, Lionel HO, and FlyerChief engines through the Base3's Bluetooth radio
- Control [Lionel RF](#) LionChief+, LionChief, and FlyerChief engines through the Base3's RF radio
- [Layout Control System](#): 3 PDI ports for expanded LCS use. Built-in circuit monitoring to protect the Base3 from PDI short circuits
- [Memory module](#) support
 - Included writable module to easily transfer your engine roster from your Base2 to your new Base3
 - Reads older Legacy engine orange modules
- Wi-Fi Base3 [firmware updates](#) using the Cab3 APP
- Dimensions: 10.3" wide X 5.4" deep X 2.6" tall

Lionel's Base3

Contents Include

When you first receive your Base3, package contents will include:

- Base3 with built-in power cable
- External antenna for Cab2 or Cab-1L control
- Writable memory module
- USB cable

Connecting Base3 to your Layout

Get Ready to Run!

Get your engines running by following the instructions in the quick start guide.

1. Thread the external antenna onto the port on the back of the Base3.
2. Connect a wire to the TRACK U post on the back of the Base3. Connect the other end to the ground/U terminal of your AC transformer or the outside rails of your track.
3. Plug your Base3 power cord into a grounded wall outlet. **WARNING! 120VAC ONLY!**
4. Flip on the power switch on the back of the Base3. The Base3 will flash its [front lights](#) for approximately 15 seconds while performing a systems check. When it finishes, the lights on the front will go out and the LIONEL lights at the ends will pulse, indicating that it's ready to go!



Base3 Power Switch

5. Turn on your CAB hardware remote or [download the Cab3 APP](#). If using the Cab3 APP, check that the AP/Network Switch on the front of the Base3 is set to AP mode. Then connect your smart device's Wi-Fi to the Base3's Wi-Fi and then launch the Cab3 APP!
6. Address the TMCC ID of your engine and learn to use the Velocity Throttle, Whistle, Bell, Brake and Direction commands.

Connecting Base3 to your Layout...

Location

For smaller layouts you can locate the Base3 anywhere on, near, or under the layout.

For a large model railroad layout, the best position for your Base3 is as close to the center of your model railroad as you can get. This gives maximum communication strength to every corner of your layout. Experiment for the most advantageous position of your Base3.

Power Up the Track

With your engine on the track and ready to roll, power-up your track to a constant 18VAC. If a circuit breaker trips when you turn on the LIONEL power supply, check the wheels of your locomotive and any cars to make sure they are all securely on the track. Check to make sure the track is free of all metals that may cause a short circuit.

Get to know your Base3

It's important to know what the various external features of the Base3 are.

Let's start with the front. The below image describes the push buttons and slide switches on the front of the Base3.



Base3 Buttons & Switches

Push button functions:

- **WPS Connect:** This is used for connecting your Base3's Wi-Fi to your home Wi-Fi network. Click [here](#) for more details.
- **Remote channel:** Set the remote channel number (1 through 9) on your Cab2 or Cab-1L handheld remote. Click [here](#) for more details.

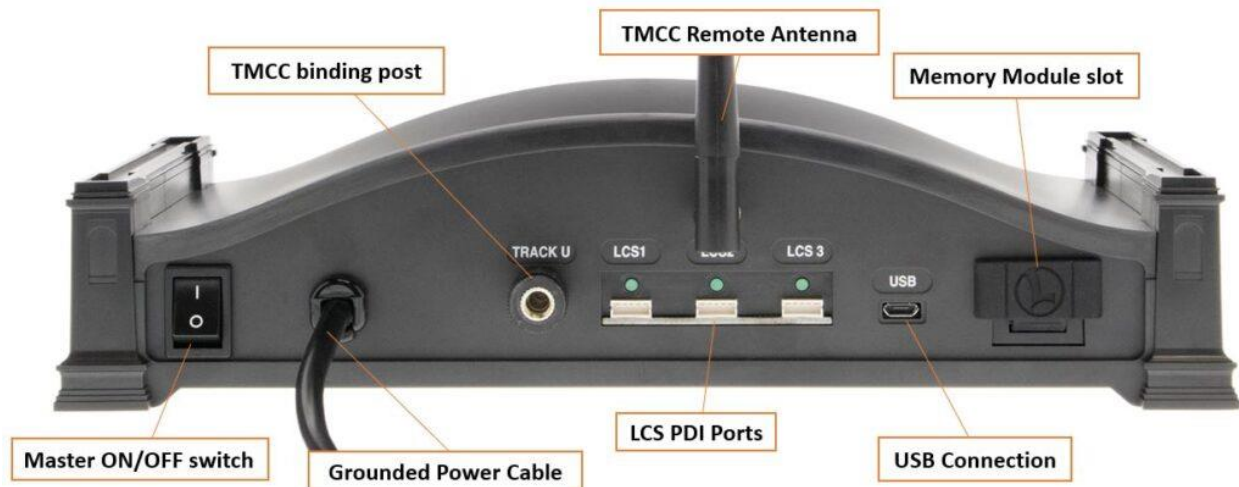
- **Bootloader:** The icon is a gear. This is used when updating the Base3's firmware. Click [here](#) for more details.

Slide switch functions:

- **Wi-Fi AP/Network:** Set the Base3's Wi-Fi to either Access Point or set it to join an existing Wi-Fi Network. Click [here](#) for more details.
- **BLE RUN/PGM:** For programming Bluetooth LionChief engines into the Base3. Click [here](#) for more details.
- **RF RUN/PGM:** For programming RF LionChief engines into the Base3. Click [here](#) for more details.

The functionality of the various lights on all sides of the Base3 are described [here](#).

Now onto the back of the Base3. The image below shows the various features on the rear of the Base3.



Base3 Rear Features

Back plate feature listing:

- **Master ON/OFF Switch:** This turns on and off the main power to the Base3.
- **Grounded Power Cable:** This should be plugged into a 120VAC outlet only. Using a 240VAC power source will damage the Base3. Make sure the outlet is earth grounded as that is critical for TMCC/Legacy communications.
- **TMCC Binding Post:** Connect this post to your AC transformer's ground/neutral post or to your layout's grounded outside rails on the track. This sends the TMCC/Legacy signals to the locomotives on the track.
- **[LCS PDI](#) Ports:** 3 different connections for adding LCS components to your layout.
- **TMCC Remote Antenna:** Used for a Cab2 or Cab-1L remote to communicate to with the Base3.
- **USB connector:** Used for a physical connection to a PC with the included USB cable.

- **[Memory Module](#) slot: Use a Lionel Memory Module to upload your Base2 database, add individual engine information, backup the Base3 2-digit database, and more.**

Base3 Wi-Fi Connection

With the Base3's built-in Wi-Fi, you can operate your model railroad using devices such as smartphones and tablets. Wi-Fi works with the Cab3 APP for Android and iOS devices and also the LCS APP for Apple iPad. The Base3 can create its own independent Wi-Fi network or join an existing one. Up to 10 Wi-Fi devices can be connected at once.

The B3SU (Base3 System Utility) can aid in configuring the Base3 Wi-Fi to your home or club network. To download and learn more about B3SU, click [here](#).

Note: This page will explain how to configure your Base3's Wi-Fi using a PC and the Base3 System Utility. For information on configuring the Base3 Wi-Fi using the Cab3 APP, click [here](#).

Base3 Wi-Fi Configuration

Configuring Your Wi-Fi Connection

The illustration below shows the switch and push-button on the Base3 that assists in configuring the Wi-Fi connection.

- A – ACCESS POINT or JOIN To NETWORK switch
- B – WPS ENABLE push-button
- C – Orange Wi-Fi Connection status indicator
- D – Green Wi-Fi Activity Indicator



Base3 Wi-Fi Buttons

Note: When using “Join to Network” mode, you may experience control lags due to latency in the network when the network is experiencing heavy traffic.

Access Point Mode

This section explains how to connect to the Base3 using the [B3SU](#). For instructions on how to connect using the Cab3 APP, click [here](#).

Access Point mode creates an entirely new network, with a SSID of “Lionel Base3 – NNNN”. The “NNNN” represents the last 4 digits of the Wi-Fi Radio’s MAC address which is unique to each Base3.

To select “ACCESS POINT” mode:

1. Slide the “ACCESS POINT / JOIN to NETWORK” switch to “ACCESS POINT”.
2. Connect your PC to your Base3’s Wi-Fi network.
 - o Your PC must be equipped with Wi-Fi to connect to the Base3. The B3SU will not connect to the Base3 using the USB cable.
3. Launch the B3SU. It should connect to the Base3 automatically as indicated on the status bar at the bottom. If it does not, click “Configure” at the top, click “Communications”, and make sure the Base3’s IP address is set to “192.168.111.1”. Then click “OK”.

Join to Network Mode (WPS)

If your Wireless Router supports “WPS” (Wi-Fi Protected Setup), then you may add the Base3 Wi-Fi to your home network. Now your smart device or PC can seamlessly access the internet and run your

layout. However, if your home network is busy, you may experience latency (slower response to your commands) when using the JOIN to NETWORK mode of operation.

To select “JOIN to NETWORK” mode:

1. Slide the “ACCESS POINT / JOIN to NETWORK” switch to “JOIN to NETWORK”.
2. Press and hold the “WPS” push button on the Base3 for 2 seconds. The orange “L” logo LEDs on the front will flash in an alternating fashion.
3. Press the “WPS” button on your wireless router. The devices will negotiate a secure connection.
4. Be sure your smart device is connected to your existing Wi-Fi network.
5. Launch the B3SU. Click “Configure” at the top, click “Communications”, and click “Search”. Once the B3SU finds the Base3’s new unique IP address, it will connect. Click “OK”.

Note: If the B3SU fails to find the Base3’s new IP address, you may need to log in to your Wi-Fi router and search for the Base3’s IP address under the DHCP client list. See your Wi-Fi router’s manual for more information.

Note: If a WPS connection is made, the green activity light will come on for 3 seconds and then turn off. If the green activity light does not come on and the “L” logo lights stop sequencing, the WPS pairing failed. You may try again by pressing the WPS on the router then on the Base3, and watch for the green light. After trying the sequence several times and the pairing is not established, the “L” logo lights will flash rapidly. The “Gear” button can be used to stop the flashing of the “L” logo lights. Power cycling is required in this situation to reset the Wi-Fi system.

Join to Network Mode (without WPS)

If your wireless router does not support WPS, you can still connect your Base3 to your network using the network’s SSID and password. This section explains how to connect it using the [B3SU](#). For instructions on how to connect using the Cab3 APP, click [here](#).

1. Slide the “ACCESS POINT/JOIN to NETWORK” switch to “ACCESS POINT” and power the Base3 on.
2. Connect your PC to the Base3’s Wi-Fi network.
3. Once connected, open the Base3 System Utility, and go to the “Wi-Fi Settings” tab.
4. Click “Get”.
5. Enter your network’s SSID and password. Click “Set”.
6. Flip the “ACCESS POINT/JOIN to NETWORK” switch to “JOIN to NETWORK”.
7. Connect your PC to your Wi-Fi network.
8. Your Base3’s IP address will have changed once on the network. If the B3SU does not automatically find and connect to the Base3, click “Configure”, “Communications”, and “Search”. Once the tool finds a valid Base3 IP address, click “OK” and the connection will now be made. It

is recommended to record this IP address to make it faster to connect using the B3SU or the Cab3 APP.

Note: Alternatively, you can look up the Base3's IP address by logging into your router and looking at the DHCP Client List.

Wi-Fi Indication Lights

The Base3 has 2 lights related to the Wi-Fi system.

The orange "L" logo light indicates the Wi-Fi connection status. The "L" will be off when no clients have connected to the Wi-Fi. When one or more clients have connected to the Wi-Fi, then the LED will turn solid ON.

The second is the green light bar. This flickers when there is Wi-Fi activity.

Changing the Wi-Fi Channel

In most installations, it will not be necessary to change the Base3's Wi-Fi channel. However, if you suspect your Base3's Wi-Fi is in conflict with another nearby Wi-Fi network, you may improve performance by changing the Wi-Fi's channel. This is done using the Wi-Fi configuration menu in the Cab3 APP or the B3SU.

Wi-Fi Channel Frequency List

The following table lists the standard 2.4GHz channel frequencies. If you know the frequency of a device you think may be in conflict with the Base3's Wi-Fi, use the table to choose which frequency may best solve the interference issue.

Channel Number	Lower Frequency MHz	Center Frequency MHz	Upper Frequency MHz
1	2401	2412	2423
2	2406	2417	2428
3	2411	2422	2433
4	2416	2427	2438
5	2421	2432	2443
6	2426	2437	2448
7	2431	2442	2453
8	2436	2447	2458
9	2441	2452	2463

10	2446	2457	2468
11	2451	2462	2473

2.4 GHz Wi-Fi Channel Frequencies

TMCC Frequency List

You can also change the TMCC remote channel to help alleviate interference issues. When the Base3 is in "ACCESS POINT" mode, the Wi-Fi channel will automatically be changed to whichever channel best operates with the TMCC remote channel. When the Base3 is in "JOIN to NETWORK" mode, the Wi-Fi channel must be changed manually.

The following table lists the TMCC remote channel frequencies in the Base3. Use this as a guide to select the best channel if you are experiencing interference issues.

TMCC Channel Number	Channel Frequency MHz
1	2404.0
2	2412.2
3	2420.4
4	2428.6
5	2436.8
6	2447.6
7	2458.4
8	2469.2
9	2480.0

Base3 TMCC Remote Channel Frequencies

Wi-Fi Configuration Lock

Setting a Lock Code on the Base3 Wi-Fi will prevent any changes to the Wi-Fi configuration including SSID, Password, Channel, and the unlock code itself, until a successful unlock request is made.

The lock code is "0000" by default, which is unlocked. Use the B3SU to set a Lock Code.

Wi-Fi Config commands:

GET will return all config data, including any lock code that was set. This allows the B3SU to recover the code in case it is forgotten and then a recovery can be made using the code. The Cab3 APP will NOT

display the code that is returned if the unlock code is non-zero. The code can only be recovered using the B3SU.

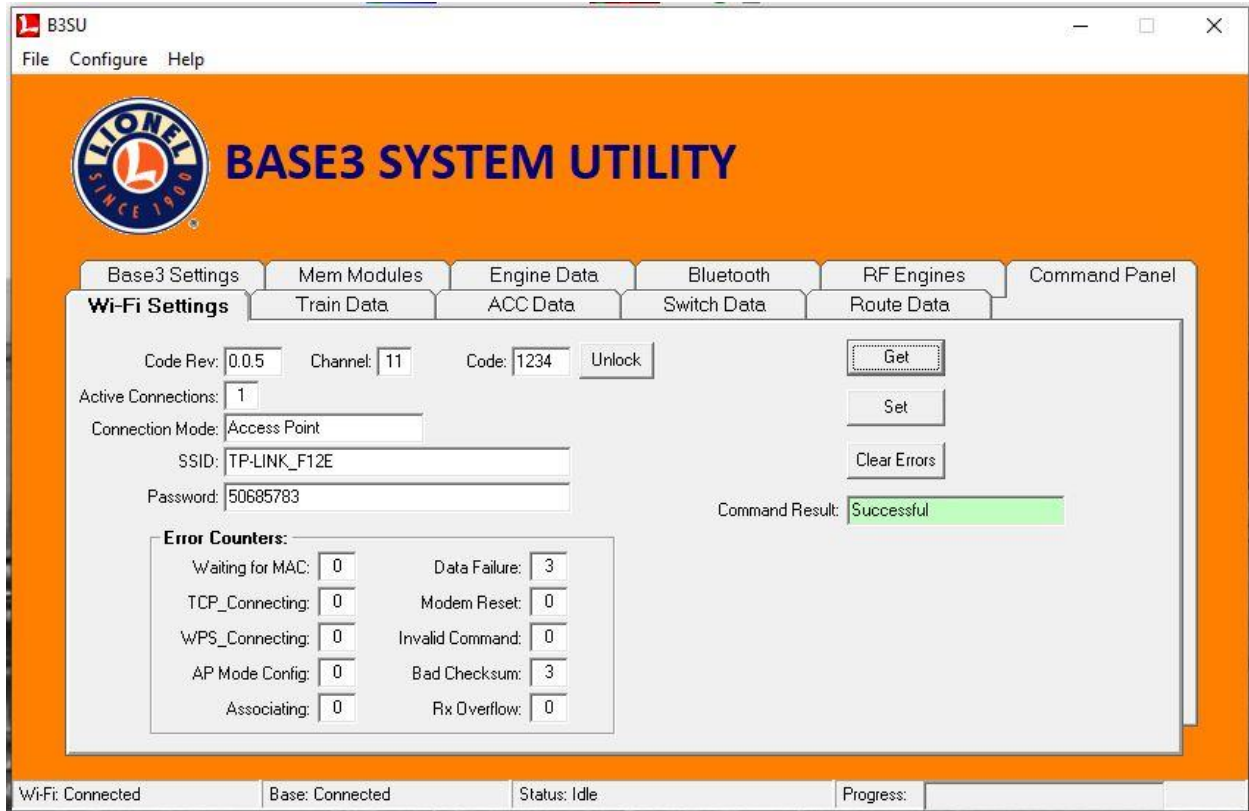
SET will check the lock code to be non-zero, and if so then check if a prior unlock request was made. If the unlock request was not made or was unsuccessful, updates to the config settings are ignored.

General operation:

Once a lock code is set, a specific request to unlock the interface must be sent and the request must have the correct unlock code. Without this sequence, changes to the config settings are not allowed.

The unlock grant is per connection, so one user may open the access, but other users must also enter the unlock code for them to be able to change the settings.

Closing the connection from the client will relock the access and upon reconnection of the client, the unlock code must be reentered to allow changes to be made to the settings.



B3SU Wi-Fi Config

Note in the B3SU screenshot above, the Code has been set to '1234'. Once set, this code must be entered in the B3SU or in the Cab3 APP to both view and edit the Base3's Wi-Fi configuration settings. Setting the Code back to '0000' will unlock the settings at all times.

Wi-Fi Troubleshooting

Q: Base3 Wi-Fi isn't working and the LIONEL lights are flashing?

A: If the Wi-Fi switch is set to AP mode, the Base3 will try to initialize in the AP mode. If the Wi-Fi does not initialize properly, the Base3 will flash the breath lights, and additionally the orange “L” logo lights will flash rapidly. The Base3 will need to be serviced to correct this type of problem as it indicates a hardware error.

Q: Base3 is in Network mode and I’ve entered my SSID and password, but it isn’t connecting?

A: If the Wi-Fi switch is set to Network mode, and the Base3 was previously paired to a router, and the Base3 cannot establish connectivity with that router, the “L” logo lights will flash rapidly. The breath lights will not flash, as the Base3 is operating normally. The “Gear” button can be used to stop the flashing of the “L” logo lights.

1. Check that you’ve correctly entered the SSID and password.
2. Make sure the AP/NETWORK switch is in NETWORK.
3. Try resetting the power to your router.
4. Try power cycling the Base3.

Q: How do I clear a Wi-Fi router from the Base3’s database?

A: If the Base3 has previously been paired with a router and this is no longer desired, the user can clear the SSID and Password pairing by holding the WPS button before turning on the Base3. The “L” logo lights and the green light will flash alternately. Power cycle the Base3 again to establish normal operation.

Cab2 Remote with the Base3

Setting Base3 & Cab2 channel number

When you are operating in a club environment or a display environment with two or more Railroads in operation in close proximity there will be communication problems if both Railroads are using the same channel on their respective Command Bases. You must change one of the Command Bases to a new channel and then match the Cab2 remote you wish to use to that channel.

Learn the Channel of your Base3:

- Press the “Remote Channel” button on the front of your Base3. Watch the Base3 yellow light bar blinking
- Observe and note the number of repetitions
- That number is the channel of your Base3

Change the Channel of your Base3:

- Press the “Remote Channel” button on the front of your Base3 again.
 - Each time you press the button the Base3’s channel will change.
 - The channel can be between 1 and 9.

- Watch the Base3 yellow light bar blinking
- Observe and note the number of repetitions
- That number is the new channel of your Command Base
- Repeat to change the channel of your Command Base again.
- Your Cab-2 remote must be set to the same channel as your Base3 to operate with it.

Match the Channel of your Cab2 and Base3

- Press the CTC button
- Scroll to channel select
- Using the Touch-Screen numbers, enter the channel of your Base3
 - The same number you located by watching the Base3's yellow light
- The system operates on the same frequencies as many other common wireless devices. If you experience signal quality issues, or lack of range between the Cab2 and Base3, you may need to change channels to resolve the issue.

Base Communication

Two command base units cannot exist on the same channel. If two bases in close proximity are set to the same channel, range and reliability will be compromised.

Radio Link Warning Light

If you are operating the Cab2 out of range of the Base3, a red Radio Link Warning Light will flash on your remote. If the Radio Link Warning Light triggers at close range, it is a good indication that the channel frequency is experiencing signal quality issues. Try to find the best channel for your environment. A clean channel can extend range greatly and ensure reliability.

Interference from Cameras

Popular wireless cameras used in the railroad hobby use channel 1-4. Setting the Base3 channel at 5 or above will correct the problem.

For more

For more information on the Cab2 remote functionality, review it's manual by clicking the link below.

Cab-1L Remote with the Base3

This guide will walk you through how to use your Cab-1L remote with the Base3. For using the Cab-1L remote with other command bases, such as the Base-1L or Legacy Base2, see their respective user manuals.

The Cab-1L is the simple way to start operating in the LIONEL LEGACY Command Control environment – and an economical way to add operators when running trains with friends! Whether you want to access the basic features of the LEGACY control or operate older TMCC equipment, the Cab-1L remote controller allows you to walk around your layout while controlling your trains. The Base3 receives signals from the remote and sends your commands across the layout. If you are looking to get started with the LEGACY Control System, the combination of Cab-1L and Base3 is the perfect way to start unlocking many of Lionel’s celebrated features. Only one Base3 should be used on a layout. You may use a combination of Cab2 and Cab-1L remotes with a single Base3.

Connecting Cab-1L to the Base3

Installing batteries in your Cab-1L remote controller

Your Cab-1L remote controller is powered by four AA batteries alkaline (not included). To install the batteries, slide open the cover on the back of the remote, and place the batteries in the remote according to the + and – symbols molded in the remote.

A few basic warnings:

- Be sure that the +/- of each battery is positioned as shown in the battery compartment.
- Use only new AA alkaline batteries.
- Never mix new and used batteries or use different types together.
- Remove the batteries from the remote when the remote will not be used for an extended period of time

Connecting Cab-1L to Base3

When you are operating in a club environment or a display environment with two or more command bases in operation in close proximity there will be communication problems if both are using the same TMCC remote channel. You must change one of the Command Bases to a new channel and then match the Cab-1L remote you wish to use to that channel.

The CAB-1L communicates with the Base3 at a frequency of 2.4 GHz. Within this band, there are nine distinct channels available to use; the default channel is 1. Chances are, channel 1 will be fine for your layout and you’ll have no need to change channels on your system. However, the 2.4 Ghz frequency spectrum is also used by WiFi, cordless phones, and various other devices you may have near your layout. If you are having trouble maintaining reliable communication between your Lionel remote and layout, experiment with different channels following the instructions shown here.

To learn the channel of your Base3

1. Press the “Remote Channel” button on the front of your Base3. Watch the Base3 yellow light bar blinking
2. Observe and note the number of repetitions
3. That number is the channel of your Base3

To change the channel of your Base3

Press the “Remote Channel” button on the front of your Base3 again. Each time you press the button the Base3’s channel will change. The channel can be between 1 and 9.

1. Watch the Base3 yellow light bar blinking
2. Observe and note the number of repetitions
 - That number is the new channel of your Command Base
 - Repeat to change the channel of your Command Base again.

Your Cab-1L remote must be set to the same channel as your Base3 to operate with it.

To match the channel of your Cab-1L and Base3

1. Remove the sliding cover over the SET key at the bottom front of the Cab-1L.
2. Hold down the SET key and press a number key (1 – 9) to pick the radio channel to transmit on.
3. The speaker will beep to give feedback when the channel is configured, either one beep if a base responds, or three beeps if no base responds. The new channel number will be saved.

Both types of beeps mean that a channel has been configured, but if there happens to be a base in range when the channel is set, then the one beep signal means that communication has been established with the base. Three beeps means that no base responded when test commands were transmitted by the Cab-1L during channel configuration. If this happens when a base is within range, then it may be that the base is set to a different channel than the one you just selected for your Cab-1L.

Once you’ve heard the “single-beep” confirming your Cab-1L has connected to a base you’re all set. You can further confirm communication is working by turning the throttle or pressing a button on your remote. The red LED light bar on your Base3 should illuminate in response to incoming commands.

The system operates on the same frequencies as many other common wireless devices. If you experience signal quality issues, or lack of range between the Cab-1L and Base3, you may need to change channels to resolve the issue.



Cab-1L_SET

Base Communication

Two command base units cannot exist on the same channel. If two bases in close proximity are set to the same channel, range and reliability will be compromised.

Interference from Cameras

Popular wireless cameras used in the railroad hobby use channel 1-4. Setting the Base3 channel at 5 or above should correct the problem.

Command-equipped Locomotives

Programming ID #s for your Command-equipped locomotives

Every Command-equipped locomotive comes factory-programmed with TMCC ID Engine #1. You may wish to assign a new ID#, using any number from 1 through 98 (do not use engine 99, as this is the universal ID# that all LEGACY-equipped locomotives will respond to). To make it easy to remember, try using part of the locomotive cab number. For example, ID your Lionel F3 no. 2343 to “#23” or “#43.” We use 23 in our example.

Here’s how to give a Command-equipped locomotive its new ID#. Make sure the Command Base is ON. Refer to the Command-equipped locomotive owner’s manual(s) for PROGRAM/ RUN switch locations. Holding the locomotive, slide its control switch to the PRG, PROG or PROGRAM setting. Place the locomotive on track and power up your railroad.

Using CAB-1L, press ENG, the ID# (any number 1 to 98), then press and release the SET button located under the removable panel on CAB-1L. Hear the horn or whistle blow, or the headlight flash. This confirms your new ID #. Slide the switch back to RUN and you’re ready to go.

Want to change your locomotive’s ID#? Just repeat these steps any time.

Example

Assign an engine ID# to
Santa Fe 2343 on Track #1

Command Base ON, track power off

Slide the locomotive PROGRAM/RUN
switch to PRG/PROG/PROGRAM

Place locomotive on track

Turn track power on

Set TMCC ID to Engine #23:



Press ENG



Press 23 (the ID#)



Press and release the SET (under
removable front panel at the
bottom-front of your CAB-1L)

Hear horn/whistle sound (or see the
headlight flash)

Slide the switch back to the RUN posi-
tion.

Your engine remembers its ID# forever;
change it any time—just repeat these
steps




Addressing Locomotives



To operate a Command-equipped locomotive, press ENG and its ID# on CAB-1L. Turn the throttle or press any command button; the sound system starts up (equipped locomotives) and the engine is ready to begin operations.

Example

Address Engine #23



Press ENG



Press 23 (the ID#)

Throttle up or press any command button

Cab-

1L_AddressngLoco

Activating whistle quilling on Legacy locomotives (optional)

The Quilling Whistle is a key feature of LEGACY locomotives. “Quilling” allows you to continuously vary the intensity of the whistle, creating your own unique signature sound. By default, CAB-1L sends TMCC style horn commands in order to be compatible with non-LEGACY locomotives. Because LEGACY locomotives respond to these older commands, too, you’ll still hear horn or whistle sounds, but you won’t be able to quill.

To set Quilling horn/whistle for one engine or train ID:

Remove the sliding cover to expose the SET key at the bottom-front of the CAB-1L.

Select a current engine or train in the usual way by pressing either ENG and enter the ID# or TR and enter the ID#.

1. Hold down the SET key and press the WSTL/HRN key to toggle the whistle configuration
2. between TMCC1 and LEGACY style for the current engine or train. The CAB-1L will beep once
3. if the TMCC1 whistle style is selected, or it will beep twice if the LEGACY quilling whistle is selected instead.

Repeat this process for each LEGACY locomotive ID. Note that this horn setting for engines and trains is saved internally within the CAB-1L itself. This means that if more than one CAB-1L is being used on your layout, each one must be programmed to set the horn style for a given engine or train. The CAB-1L will remember the settings until you change it.

Note! Remember that older TMCC1 locomotives don't support quilling and won't sound at all in response to LEGACY quilling commands. If an engine stops responding to the WSTL/HRN button, but its bell is working correctly, change back to TMCC1-style whistle for that particular Engine ID and all will be well.

Sending basic commands to locomotives with Cab-1L

The corresponding RailSounds sound system effects are in *italic type*. Some locomotives may not support all listed features.



Opens your locomotive's front coil coupler (equipped locomotives). *Coupler release sound.*



Opens your locomotive's rear coil coupler (equipped locomotives). *Coupler release sound.*



Toggles the locomotive's headlight on and off.



Controls the speed of your locomotive. Turn the **THROTTLE** to the right to accelerate, to the left to decelerate. There is no "stop." If you don't press a button or turn the throttle for 30 seconds, CAB-1L goes into battery-saving "sleep" mode. Turn the throttle or press any button to "wake" it up.



Activates the locomotive's horn or whistle as long as you hold the button. *Steam whistle or diesel horn sound.*



Press **BELL** to activate the bell, again to discontinue. *Steam bell or diesel bell sound.*



In command control, **DIR** operates differently than in conventional Lionel operations. Press **DIR**—the locomotive decelerates to complete stop; turn the throttle up, and the locomotive will accelerate in the new, opposite direction. **THERE IS NO NEUTRAL.** *Steam or diesel let-off sound.*



Press and hold **BOOST** for extra power. Release **BOOST** and your locomotive returns to its previous speed. *Labored chuff sound, fuller diesel prime mover.*



Press and hold **BRAKE** when you want to slow down or stop. Release **BRAKE** and your locomotive returns to its previous speed. *Squealing brake sounds. Coasting chuff, quieter prime mover.*



Press **HALT** for emergency stops only. **HALT** stops all Command-equipped locomotives in action and shuts down all remotely-controlled track power transformers.



Cab-1L_Commands

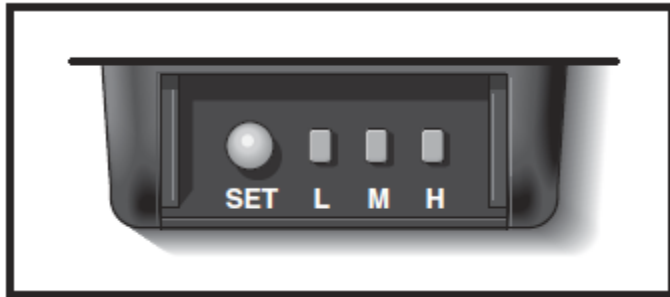
Tuning your locomotive's performance

Setting Momentum

The LEGACY system's momentum feature simulates the labored performance of a real life locomotive pulling a heavy load. Press L, M, or H (located under Cab-1L's removable panel) for light, medium, or heavy momentum. The locomotive remembers this setting until you change it. For normal (quick) locomotive response, press L.

Get a feel for the difference in momentum settings. Select L, M, or H. Turn your throttle slightly and wait a few seconds for the locomotive to respond.

Note that on LEGACY locomotives, L, M and H settings change the number of individual speed steps your locomotive supports. A setting of L gives 32 speed steps, M yields 100 speed steps and H provides 100 speed steps with added momentum.



Cab-1L_SET2

Setting Stall

Make your locomotive feel more responsive with stall (this tip is especially applicable to Pullmor powered TMCC locos). Get your locomotive moving and press SET; the locomotive will stop. Turn the throttle clockwise to get the engine moving, then decrease speed until the locomotive just stops. Press SET again. *Even if your locomotive doesn't move after turning the throttle, just press SET again.* Stall will be set. Your locomotive remembers the stall setting until you change it. To clear stall, press SET twice, holding it for one second each time.












STALL EXPLAINED:

Set a command-equipped locomotive's stall, and it skips from zero power to stall when you turn the throttle. Stall eliminates unnecessary throttle rotation—making your locomotive more responsive.

Note! Not all engines support Stall.

Sending numeric commands to locomotives

When you address a locomotive and press any non-numeric button such as AUX1, you enable 10 numeric command buttons. Turning the throttle or entering more than two digits for a locomotive address will also enable numeric commands. The numeric keypad issues commands listed below until you press any top-row button (SW, ACC, RTE, TR, or ENG). *The corresponding RailSounds sound system effects are in italic type.*

-  Halts and resets a locomotive. Resets direction to FORWARD or the control switch's direction setting. *Blows whistle or horn.*
-  Raises the volume in RailSounds-equipped locomotives. *Sound volume increases.*
-  Dialog scene—engineer. speaks first. Scene varies in motion vs. stop, optional leading AUX-1. *CrewTalk announcements.*
-  Raises the RPM level in RailSounds—equipped diesel locomotives. Starts up RailSounds in any currently addressed locomotive. *RPMs increase. Steam blowoff. Startup sequence commences.*
-  Lowers the RPM level in RailSounds-equipped locomotives. *Sound volume decreases.*
-  When stopped, activates shutdown sound in RailSounds equipped locomotives. Horn/whistle, bell, and RPMs will not sound until you restart RailSounds by pressing 3. (In motion, triggers dialog scene). *Steam or diesel shutdown sequence commences and/or dialog.*
-  Lowers the RPM level in RailSounds-equipped diesels. *RPMs decrease. Steam letoff.*
-  Dialog scene--dispatcher speaks first. Scene varies in motion vs. stop, with or without leading AUX-1. *TowerCom announcements.*
-  Smoke OFF. *Air-release.*
-  Smoke ON. *Air-release.*
-  Turns headlights on and off.

Cab-1L_NumericCommands

Switches

Controlling switches with the Cab-1L

Once you've programmed switch ID numbers (refer to the manual that came with your switch controller for this procedure), you can operate any TMCC remote-controlled switch using the Cab-1L.

Note: SWITCH SHORTHAND. After addressing a "switch", you can immediately address another switch simply by entering its ID#—you don't have to press SW again. This is so until you press another address button (ACC, RTE, TR, or ENG).

Example

To throw Switch #1 to
"out"



Press SW



Press 1



Press OUT

Switch #1 is now curved or "out"

Example

To throw Switch #12
to "through"



Press SW



Press 12



Press THROUGH

Switch #12 is now curved or "through"

Cab-1L_SwitchExample1

Notes on AUX1 and AUX2

AUX1 and AUX2 are multi-definition buttons. Their definitions depend on which top-row address button (ENG, SW, ACC, etc.) you most recently pressed.

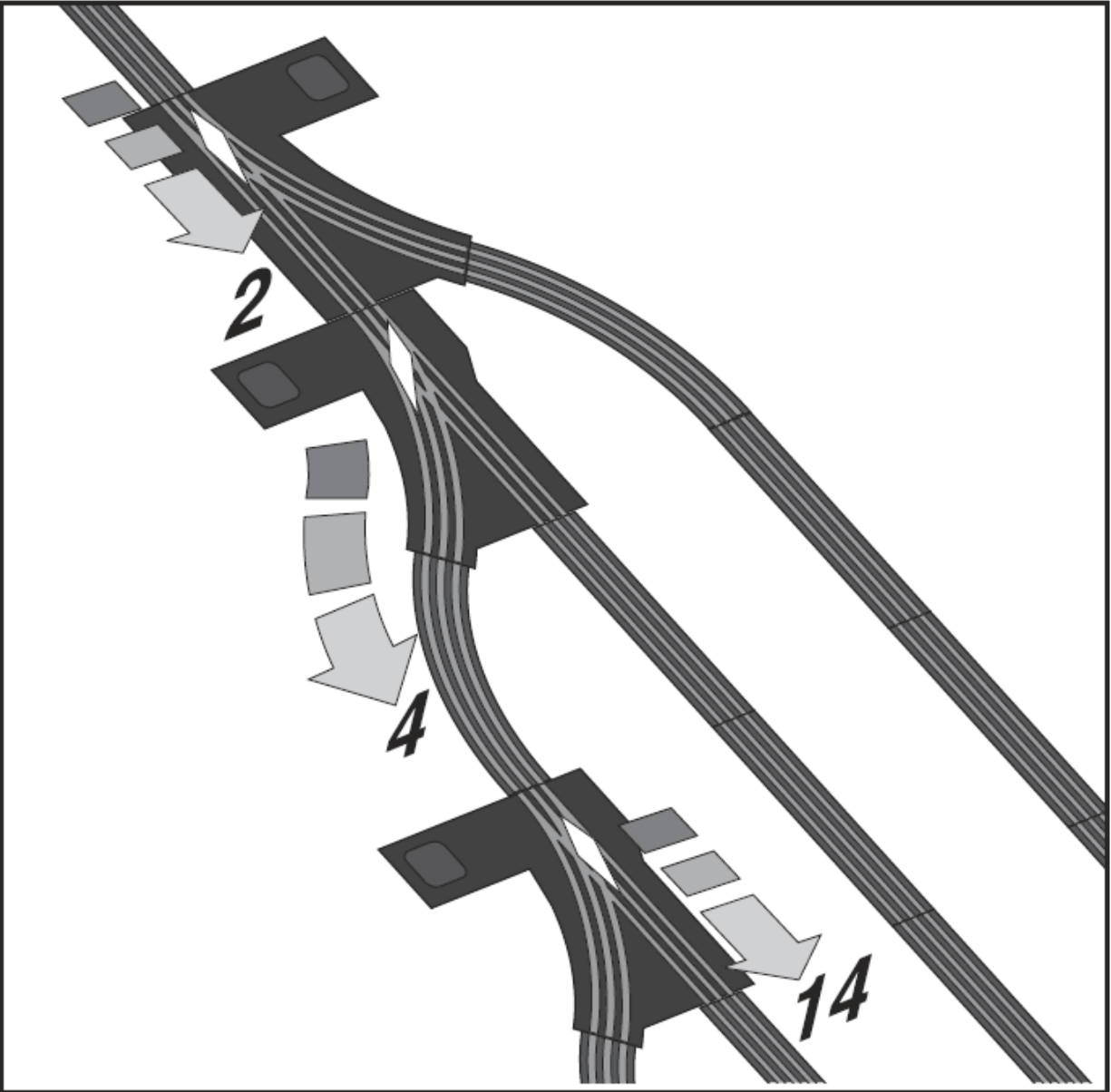
For example, press SW and AUX1/ AUX2 to control the direction of switches. Press ENG or TR and AUX1 "opens" the numeric keypad to locomotive feature control, while AUX2 controls headlight illumination. Finally, when you press ACC, the buttons change meaning again, this time to control accessory functions.

As you get comfortable with “jumping” between locomotives, switches, accessories, routes, and multi-locomotive lash-ups (“trains”), you’ll acquire a feel for the many definitions of AUX1 and AUX2. Until then, just remember our basic CAB-1 rule: AUX1 and AUX2 functions always depend on which top-row address button you’ve just pressed.

Creating routes around your railroad

Every model railroad has switches, which provide plenty of operational variety, especially when thrown in certain patterns—a route.

Here’s a common scenario: to travel from the main line to the yard, you have a preset route: Switch #2 is through (straight), Switch #4 is out (curved), and Switch #14 is through. **If your switch controller supports Routes**, you can throw all those switches with a single command—RTE.



Cab-1L_Routes1

Note: SWITCHES AND ROUTES. Any switch can be part of any route. And any switch can be on any number of routes, creating a wealth of possibilities. Experiment. Discover new pathways around your railroad with RTE. Routes are remembered forever—or until you clear them.

Note: Always check your RTE programming: throw switches opposite the RTE direction, then press RTE and the ID#; your route should immediately throw.

You can add more switches to a route at any time.

Example

Assign switches #2 (through), #4 (out), and #14 (through) to Route #1

Command Base ON

Switch controller accessory is on



Begin programming, press RTE



Press 1 (route number)



Press 2 (the switch number)



Press THROUGH



Press SET

Switch #2 is in the "through" direction on Route #1



Begin programming, press RTE



Press 1



Press 4 (the switch number)



Press OUT



Press SET

Switch #4 is in the "out" direction on Route #1



Begin programming, press RTE



Press 1



Press 14 (the switch number)



Press THROUGH



Press SET

Switch #14 is in the "through" direction on Route #1

Cab-1L_Routes2

Activating routes


Select any route you've programmed by pressing RTE and your chosen RTE ID#. Make sure you press and hold the ID# button for one full second. This ensures the command is issued to every switch controller on your railroad.


Note: "PRESS AND HOLD". When you are pressing the ID button, some of the switches may not actually throw until you've released the button. Switches activate at different times once you've selected the route

this keeps your system (and your railroad's power supplies) from overloading due to simultaneous activation of multiple switches.

Example

Address Route #1

**Press RTE**

**Press 1 for one full second**

Route #1 has been selected. Switch #2 is THROUGH, Switch #4 is OUT, and Switch #14 is THROUGH

Cab-

1L_RouteActivation

Clearing routes

Clearing an existing route requires an abbreviated version of programming a new route. In this case, do not add any switches to the route. This removes and switches previously stored as part of this route.

Example

Clear Route #1 (erase all switch assignments)



Press RTE



Press 1



Press SET

Route #1 is now ready for new switch assignments

You cannot remove an individual switch from a RTE; you must clear the entire route and start again

If you make an error during re-programming, do not press SET; start over—press RTE, the switch number, its position, and then press SET

Cab-

Tracks or Trains

The TR button on your Cab-1L can control two very different things—“TRains,” or remotely controlled “TRack” power accessories. You can run both from the same Cab-1L, as long as every one has a unique ID#.

Let’s talk TRACK power for a moment. Lionel offers a variety of accessories which provide remote control over track power. These enable you to remotely turn on and off power to all or some of your layout. In addition, some of these accessories allow you to vary the AC voltage applied to the track so you can run conventional (non-command controlled) locomotives on a command layout. You may also use variable track voltage to fine-tune performance of your accessories and command-controlled locomotives.

To operate these track power control devices (for example, a LEGACY PowerMaster), you’d assign them a unique TR ID#. Then they’d be addressed in the same way you’ve learned to operate a locomotive: by pressing TR and the ID# of the track power accessory you want to control. Refer to your track power accessory manual for specific information on setting these IDs and other operating instructions.

The second use for the TR button, as we’ve noted, is to create and operate “Trains,” a combination of two or more locomotives and/or Command Control-equipped rolling stock, also referred to as a “lash-up” in the world of Lionel. Once you’ve grouped several things into a train, they operate together, as a single locomotive.

A couple of important notes. First, older TMCC1 era equipment only supports TR commands 1-9. This is true for both track power accessories such as the original PowerMaster as well as older TMCC1 locomotives.

Lionel LEGACY locomotives and power accessories such as the LEGACY PowerMaster accept TR commands addressed from 01-99! So if you’re having trouble getting a piece of equipment to respond to TR commands, first try assigning it to TR 01-09 and see if that works. If that works, but higher numbered TR commands (10 and up) are ignored, stick with ID’s 1-9.

A further note about combining locomotives into TRAINs. Older TMCC1 and newer LEGACY locomotives cannot be combined into a single TRAIN. You can make TRAINs from two or more LEGACY engines, or two or more TMCC1 engines, but you cannot assign a mix of old and new locos to the same TRAIN ID#.

For more information on using remote track power accessories, refer to those product’s owner’s manuals.

FCC Statement

The Lionel CAB-1L is covered by FCC rules for a Class B computing device. As required by FCC regulations, the following is provided for the information and guidance of the user. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. To determine if the equipment does cause interference to radio or television reception turn the equipment off and on. The user is encouraged to try to correct the interference by one or more of the

following measures: (1) Where it can be done safely, reorient or relocate the receiving antenna; (2) Increase the separation between the equipment and receiver; (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; and (4) Consult your Lionel dealer or an experienced radio/ TV technician for help.

Programming Bluetooth Engines into the Base3

One of the key features of the Base3 is the ability to operate Lionel Bluetooth engines using a Cab2, Cab-1L, or the Cab3 App. Compatible Bluetooth engines include LionChief, LionChief Plus, FlyerChief, and even Bluetooth-equipped HO! Bluetooth-equipped engines that also have a TMCC radio, including Legacy and LionChief Plus 2.0, will be controlled by the Base3 using their TMCC radios and not Bluetooth.

Bluetooth engines are programmed in as TMCC IDs, and are remembered by the Base3 until that channel is cleared or another engine overrides it. Base3's Bluetooth firmware can operate up to 20 engines at one time. These are reserved as TMCC IDs 10 through 29.

Setting up a Bluetooth engine with the Base3 is like programming a Legacy or TMCC engine. Since Bluetooth engines do not have a RUN/PGM switch on them, that switch is on the front of the Base3.

Programming a Bluetooth Engine into the Base3

Program a Bluetooth Engine into the Base3

Make sure the Base3 is powered on and you have a connected Cab controller.

1. Place the Bluetooth engine on the track, and power it up. The engine should start chirping (or headlight flashing), indicating it is ready to be paired with.
2. On the front of the Base3, flip the Bluetooth RUN/PGM switch to PGM.
3. On the Cab controller, press ENG and the TMCC ID you wish to use (10 through 29). Then press SET. The Bluetooth engine should stop chirping, indicating connection with the Base3.
4. Slide the Bluetooth RUN/PGM switch back to RUN.
5. If using a Cab2 or the Cab3 App, make sure the engine CONTROL type is set to TMCC or LionChief. Bluetooth engines will not respond to commands if the type is set to Legacy.

You can now operate your Bluetooth engine with your cab controller. Basic commands will operate the engine, such as the throttle, bell, whistle, and basic CrewTalk. You can even toggle the smoke units on and off if the engines are so equipped.

Bluetooth Engine Information

When you program a Bluetooth engine into the Cab2 or the Cab3 App, the engine's road name and road number will automatically populate. The two-way Bluetooth communication between the engine and

the Base3 means the Base3 can read which engine it is operating, and sends that info to the cab controller.

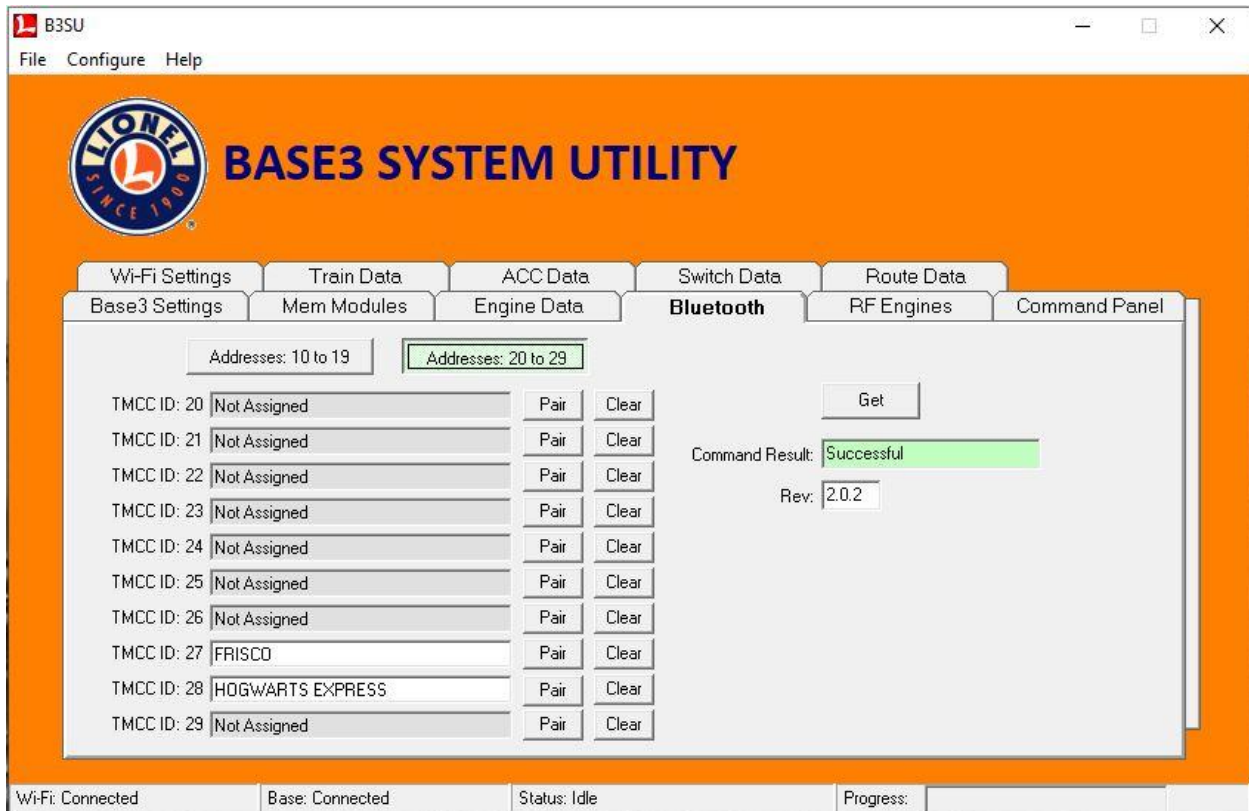
Programmed Bluetooth Engines

When you first power up your layout, the Base3 will look for any Bluetooth engines that are programmed into its database on TMCC IDs 10 through 29. If it finds any, it will connect to them automatically without you having to manually address them. This is done to prevent the engines from constantly making the chirping sound that indicates the engine is ready to be paired to.

Any Bluetooth engine that has not already been programmed into the Base3 will make the chirping sound.

IMPORTANT: WHEN THE BASE3 IS POWERED UP, ANY BLUETOOTH ENGINE THAT HAS BEEN PROGRAMMED INTO THE BASE3 WILL BE UNAVAILABLE TO OTHER BLUETOOTH CONTROLLERS SUCH AS THE UNIVERSAL REMOTE OR THE BLUETOOTH TAB OF THE CAB3 APP. TO USE THOSE CONTROLLERS, YOU MUST EITHER REMOVE THE BLUETOOTH ENGINE FROM THE BASE3 OR POWER DOWN THE BASE3.

The [B3SU](#) can be used to view the Bluetooth engines saved into the Base3's database. See screenshot below. The first tab displays IDs 10-19 and the second tab displays IDs 20-29. These pages can also be used to Pair a new BLE engine or to clear an engine from an ID.



B3SU BLE engines 20-29

Clearing a Bluetooth Engine from the Base3 Database

If you want to remove a saved Bluetooth engine from the Base3 database:

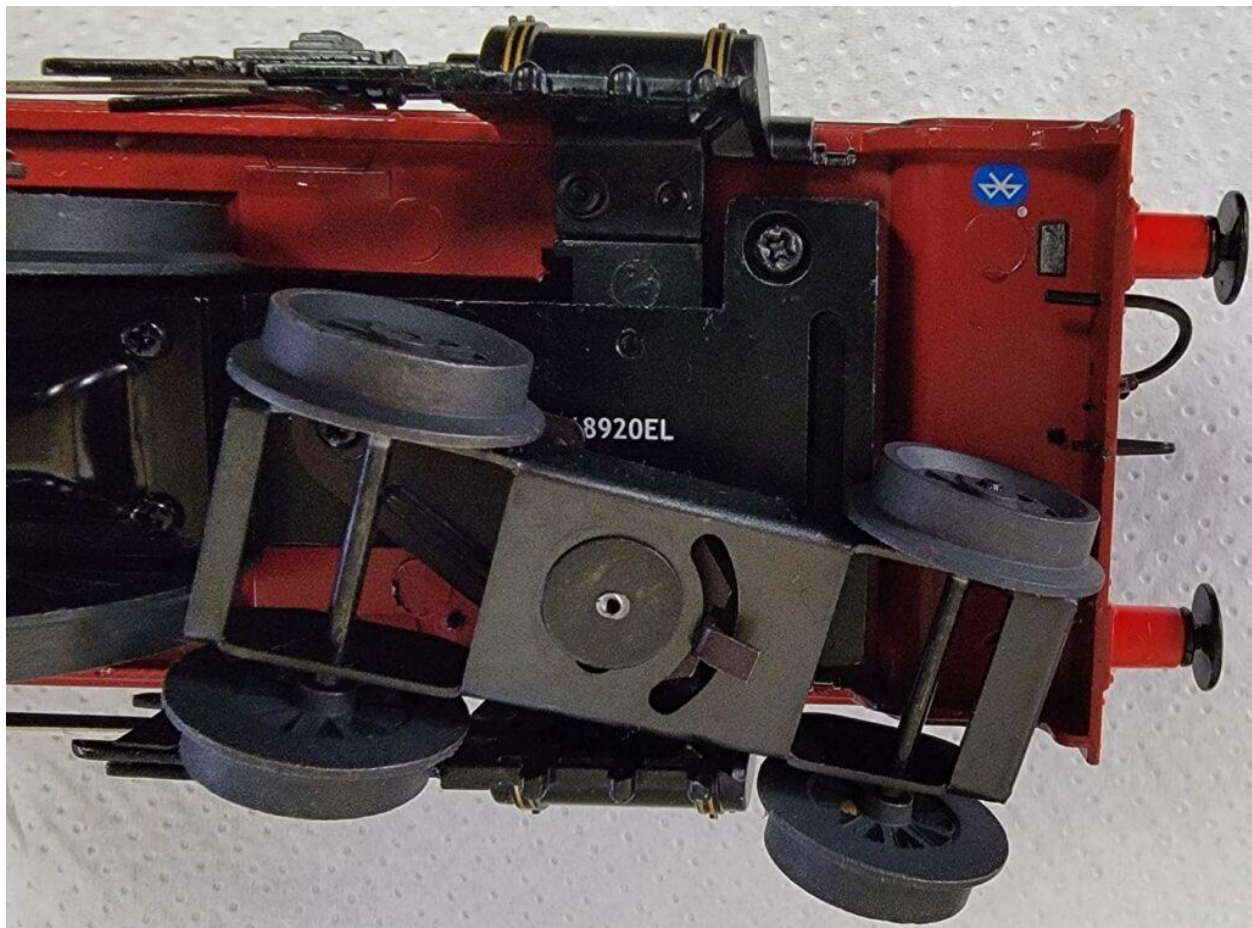
1. Slide the Base3 Bluetooth RUN/PGM switch to PGM.
2. Using the cab controller of choice, press ENG, the TMCC ID you wish to clear (10 through 29). Then hit SET.
3. Slide the Bluetooth RUN/PGM switch back to RUN.
4. Any Bluetooth engine saved to that TMCC ID is now removed.

A Bluetooth engine will also be removed from the Base3 database anytime a new engine is programmed into that TMCC ID number. This includes a different Bluetooth engine or a Legacy/TMCC engine.

How to tell if an engine is Bluetooth

There are two ways to tell if a Lionel engine that is not equipped with TMCC is Bluetooth-compatible:

1. When the locomotive powers-up, it will play a “chirping” sound. Earlier RF LionChief engines play a more defined “beeping” sound.
2. Look under the engine or tender for the Bluetooth logo. If there is no logo present, the engine may be RF. The sample Hogwarts engine shown below shows the blue BLE icon.



LionChief Loco BLE bug

TMCC Engine Disclaimer

Since IDs 2 through 29 are potentially Legacy, TMCC, RF, or Bluetooth, clearing engine information (name/number) can give slightly different results than with IDs 30 and up.

If the ID is set as Legacy, then the entry is not cleared with SET, as RF or BLE are not controlled as Legacy locos.

If the ID is set as non-Legacy (I.E. TMCC); AND the RF or BLE switch is in RUN; then the entry is CLEARED and the loco is UNPAIRED.

A TMCC engine's name/number is lost if you press "SET" when setting the ID. Just enter the relevant info once you set the loco ID.

Lastly, older PULMOR equipped TMCC engines used "SET" to set the stall speed step in the loco. In this case, the "SET" will erase the name/number. The only fix for this is to move the TMCC ID out of the 2-29 range OR re-enter the info once you set the TMCC ID and set the STALL.

Programming RF LionChief Engines into the Base3

The Base3 includes the ability to operate Lionel RF LionChief engines using a Cab-1L, Cab2, or the Cab3 App. Compatible RF engines include LionChief, LionChief Plus, and FlyerChief. These engines were produced when LionChief was first introduced in 2014 until being replaced by Bluetooth in 2017.

RF engines are programmed with TMCC IDs, and are remembered by the Base3 until that channel is cleared or another engine is programmed in. RF engines can be programmed using TMCC IDs 2 through 9.

Setting up a RF engine with the Base3 is similar to programming a Legacy or TMCC engine. Since RF engines do not have a RUN/PGM switch on them, that switch is on the front of the Base3.

Program RF Engines into the Base3

Program a RF Engine into the Base3

1. Power on the Base3 and have a connected Cab controller.
2. Place the RF engine on the track and power it up. The engine should start beeping (or headlight flashing), indicating it is ready to be paired with. (Some early RF LionChief engines play background sounds always, whether a controller is connected or not)
3. On the front of the Base3, flip the RF RUN/PGM switch to PGM.
4. On the Cab controller, press ENG and the TMCC ID you wish to use (2 through 9). Press SET. It may take a moment for the Base3 and the RF engine to fully connect. The RF engine will stop beeping, indicating connection with the Base3.
5. Slide the RF RUN/PGM switch back to RUN.
6. If using a Cab2 or the Cab3 App, make sure the engine CONTROL type is set to TMCC or LionChief. RF engines will not respond to commands if the type is set to Legacy.

You can now operate your RF engine with your cab controller. Basic commands will operate the engine, such as the throttle, bell, whistle, and basic CrewTalk. Some RF engines also have volume control.

RF Engine Information

When you program a RF engine into the Cab2 or the Cab3 App, the engine's road name and road number will automatically populate. The two-way RF communication between the engine and the Base3 means the Base3 can read which engine it is operating, and sends that info to the cab controller.

Programmed RF Engines

When you first power up your layout, the Base3 will look for any RF engines that are already programmed into its database on TMCC IDs 2 through 9. If it finds any, it will connect to them automatically without you having to manually address them. This is done to prevent the engines from constantly making the beeping sound that indicates the engine is ready to be paired to.

Any RF engine that has not already been programmed into the Base3 will make the beeping sound.

Clearing a RF Engine from the Base3 Database

If you want to remove a saved RF engine from the Base3 database:

1. Make sure the engine is powered down or removed from the track.
2. Slide the Base3 RF RUN/PGM switch to PGM.
3. Using the cab controller of choice, press ENG, the TMCC ID you wish to clear (2 through 9). Hit SET.
4. Slide the RF RUN/PGM switch back to RUN.

Any RF engine saved to that TMCC ID is now removed.

A RF engine will also be removed from the Base3 database anytime a new engine is programmed into that TMCC ID number. This includes a different RF engine or a Legacy/TMCC engine.

TMCC Engine Disclaimer

Since IDs 2 through 29 are potentially Legacy, TMCC, RF, or Bluetooth, clearing engine information (name/number) can give slightly different results than with IDs 30 and up.

If the ID is set as Legacy, then the entry is not cleared with SET, as RF or BLE are not controlled as Legacy locos.

If the ID is set as non-Legacy (I.E. TMCC); AND the RF or BLE switch is in RUN; then the entry is CLEARED and the loco is UNPAIRED.

A TMCC engine's name/number is lost if you press "SET" when setting the ID. Just enter the relevant info once you set the loco ID.

Lastly, older PULMOR equipped TMCC engines used "SET" to set the stall speed step in the loco. In this case, the "SET" will erase the name/number. The only fix for this is to move the TMCC ID out of the 2-29 range OR re-enter the info once you set the TMCC ID and set the STALL.

Base3 Indication Lights

Base3 Lights!

The Base3 includes different LED light features that are used for various reasons.

When you first power up the Base3, the lights on the front panel will alternate in series. We call this the Base3 light show! This lasts for approximately 15 seconds. During this time, the Base3 is performing a systems check to make sure all of its internal components are functioning properly. The Base3 will check its Wi-Fi Radio, Bluetooth Radio, Legacy Radio, and LionChief RF Radio to make sure things are all good. During this time, the Base3 will be unresponsive to commands. Once the light show finishes, you can connect to the Base3 and operate your trains!

Let's go over the functions of each Base3 light during normal operation.

Orange "L" logo: This Lionel "L" logo on the front center of the Base3 is the Wi-Fi connection indicator. This light will be off when no Wi-Fi devices are connected to the Base3. Once a Wi-Fi device is connected, such as a smartphone with the Cab3 App, this light will go solid until the connection is discontinued.

The light bars: These light bars are a unique method of light transmission, using side-discharge light pipes with LEDs on each end. The inspiration for these light bars comes from the automotive world, where some newer vehicles have continuous wrap-around tail lights. Each light bar represents an "activity" which is when data is being sent to or from the Base3, such as when you blow the whistle.

Green: Wi-Fi activity. Any device connected to the Base3 over Wi-Fi, such as the Cab3 App, will use this light when communicating. When you press a button on the App, a command is sent to the Base3, and this green light flashes to indicate that command being sent.

Yellow: Cab2 or Cab-1L activity. When a command is sent from one of these remotes to the Base3, the yellow light will flash.

Blue: Bluetooth activity. This light will flash when the Base3 is sending a command to a Bluetooth-equipped engine.

Red: RF LionChief activity. This light will flash when the Base3 is sending a command to a RF LionChief engine.

Blue "LIONEL" lights: These are called the breath lights. They are used to indicate that the Base3 has power. The lights slowly fade in and out. There is one of these lights at each end of the Base3. These are also used for the [Base3's internal diagnostics](#).

LCS PDI

Lionel's Layout Control System, or LCS, allows full layout control of things like operating accessories, switches, track power blocks, and more. The Base3 expands the usability of LCS by including three PDI connector ports. Each PDI port operates independently and they all communicate to the Base3's main processor, so having a single daisy chain with all LCS modules is no longer needed.

LCS PDI Cable

Connecting Base3 to LCS Modules

With the Base3, the LCS DB9 Cable with Power Supply is no longer needed. Instead, LCS modules are connected to the Base3 by using a PDI cable. PDI cables are available in 1' (6-81500), 3' (6-81501), 10' (6-81502) and 20' (6-81503) lengths. For more information, see [LCS System Cabling](#).

Base3 PDI Power

The Base3 provides 12V DC PDI power to each LCS module. The green LED above each PDI port on the Base3 indicates that the PDI power is on for that port.

Each port is rated to operate up to 10 LCS modules. That means the Base3 can handle 30 modules total. If your layout requires more than this, you may need to add an additional power supply tapped into the PDI line using a PDI cs-691JOINB00-p board. These are available on the [Lionel Support page](#).

In the unlikely event that a short occurs on one of the PDI lines that is connected, the Base3 will turn off power to that PDI output to protect both itself and the modules that are connected. The Base3 will monitor the status of that line and once the short is fixed or removed, power to that PDI port will resume. When a short occurs, the Base3's "LIONEL" lights on the sides will blink to indicate a fault.



Base3 Back

PDI is Lionel's communication protocol based on multi-drop RS232, 115.2k baud. If you're interested in learning more about the LCS system, consider joining the [LCS Partner](#) program!

Memory Modules

The Base3 supports use of memory modules originally used with the Base2 and Cab2. These modules perform various functions with the Base3:

- Included black writable memory module can be used to make a multi-engine module (MEM) to help transfer your Base2 engine roster to the Base3.
- Included black memory module can backup and/or restore the Base3's database (2-Digit only)
- Included black memory module can be used to update a Cab2 remote's firmware.
- Upload older Legacy engine information with orange memory modules to the Base3's database.
- Create engine-specific memory modules using the B3SU.

The following table describes the different memory module types and their compatibility:

Module Color Type	Description	Compatible with	
Orange	Factory Engine Module	Contains engine information	Cab2, Base3
Tan	Generic Engine Module	Contains generic engine information	Cab2, Base3
Blue	Factory OS Modules	Firmware	Cab2/Base2
Black	Writable User Module	Shipping blank	Cab2/Base2, Base3

Memory Module Types

Black Writable Memory Module

The Base3 includes one black writable memory module. The information saved to this module can be rewritten so that the module can be reused over and over again.

The black module is used for a few different tasks:

- Transfer engine data from your Legacy Base2 to your new Base3
- Backup and/or restore your Base3's database (2-Digit only)
- Update your Cab2 remote's firmware

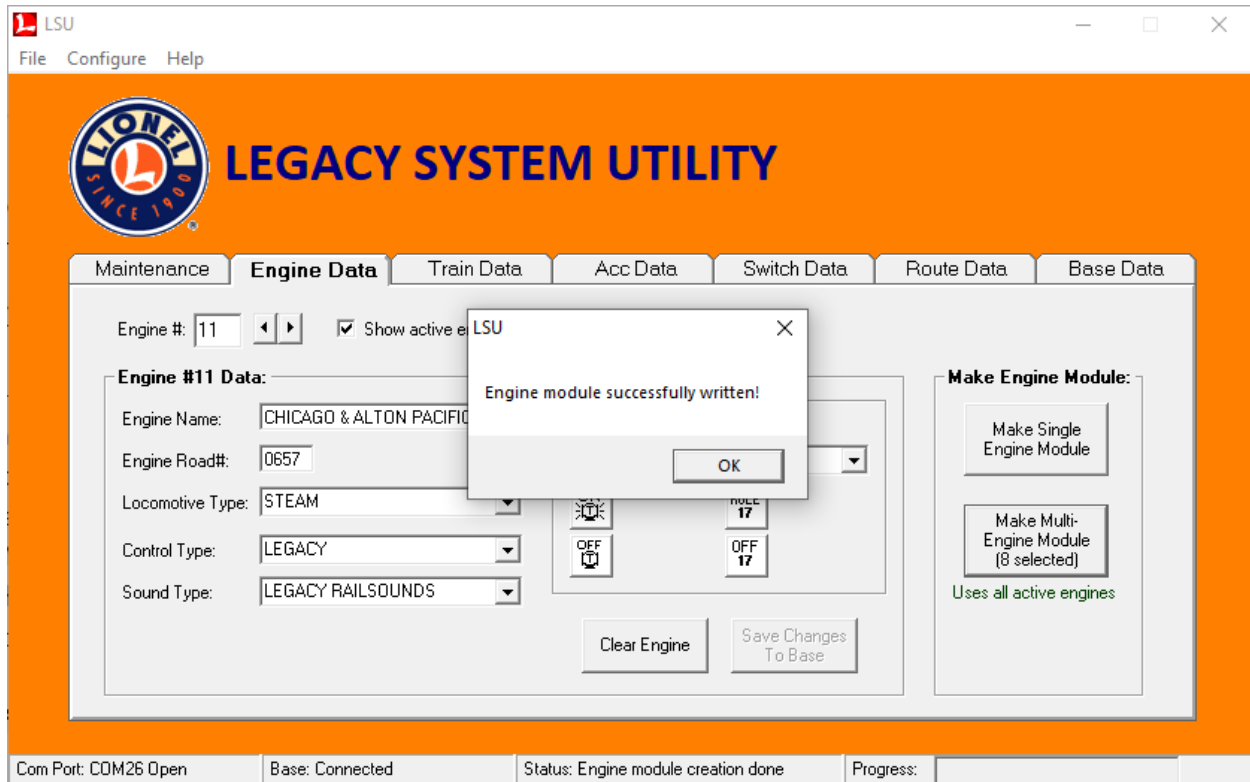
Multi-Engine Module to transfer Base2 roster to Base3

The black writable memory module can be used to make a multi-engine memory module (MEM). You can store up to 99 TMCC IDs on the module. This can help you transfer your engine roster from your Base2 to your new Base3.

Creating a MEM with the Base2

This part requires the Base2 be connected to a PC (Windows only) so that the Legacy System Utility (LSU) can build the MEM. The LSU can be downloaded from the Lionel support site [here](#). The Base2 can connect to the PC either by using a DB-9 serial cable or by using the LCS Wi-Fi module. See their respective manuals for more information.

1. Connect the Base2 to the PC and open the Legacy System Utility (LSU) application.
2. Insert the black writable memory module into the Base2.
3. Navigate to the "Engine Data" tab in the LSU. After all engine data has been loaded, click on "Make Multi-Engine Module" under "Make Engine Module" on the right.
4. Once the data has been written to the module, click "OK".
5. Remove the module from the Base2.



LSU MEM

Use a MEM module to update Base3 database

Engine information from a MEM module can be imported into the Base3's database using a few different methods. Using a Cab2 or the Cab3 APP, only one engine entry can be imported at a time. If you wish to import all of the engines saved to the MEM module at the same time, then you must use the B3SU.

MEM with the Cab3 APP

1. Insert the MEM module into the Base3.
2. Connect your smart device to the Base3 and open the Cab3 APP.
3. Connect the Cab3 APP to the Base3.
4. Press ENG, enter the number of the TMCC ID you wish to write information to, and press Enter. Swipe UP to navigate to the Engine Configuration screen.
5. Tap the "Load Module" button.
6. Use the left and right arrows to navigate through the various engines saved to the MEM module. Once you find the engine you wish to import, tap "Load Engine".
7. Tap "Back" and then tap "Yes" to update the engine record. The engine information is now stored in the Base3's database.

3:16



BLUETOOTH



BASE3

Engine Configuration

Id Address: 0086

Road Name:

Road Number:

LOAD ENGINE MODULE

TMCC Id: 86

Multi Engine Module Detected

B3SU Module 0730

PERE MARQUETTE BERKSHIRE



Engine Record 7 of 8



Correct Module Type Inserted

LOAD ENGINE

CANCEL

BLUETOOTH LIONCHIEF CONFIG

CLEAR

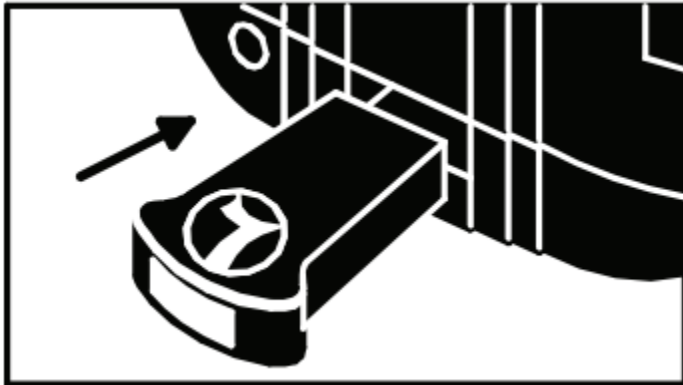
BACK



Cab3 MEM Module Import

Updating Cab2 firmware using black memory module

1. Download the latest Cab2 firmware from the [Lionel Support Site](#).
2. Plug the black memory module into the Base3
3. The firmware can be installed into the black memory module using one of two ways:
 1. Using the Cab3 APP. Click [here](#) for more information.
 2. Using the B3SU (Base3 System Utility). Click [here](#) to download and install the B3SU.
4. After the firmware has been downloaded to the black memory module via the previous step, unplug it from the Base3.
5. Turn off the Cab2 remote and plug in the black memory module.
6. Press and hold the SET and CTC buttons. Wait 10-15 seconds and your screen will display the main page. The remote firmware is now updated.



Cab2 Memory Module Install

Orange Memory Module for older Legacy Locomotives

Your Legacy engines perform best when all its options are loaded into the Base3 database. Older Legacy locomotives included an orange memory module, which is one way to load these settings.

Orange Memory Module Procedure using Cab2

1. Address a Legacy engine with its TMCC ID#
2. Press INFO
3. Select LOAD with the soft keys
4. Insert your Orange module into your remote
5. Follow the on-screen prompts to load the engine info

Information about your engine will be downloaded into the Base3 database and associated with the ID# you entered in step 1. This information will now be used by all remotes connected to the Base3.

Cab2 Loading Engine Module

Tan Engine Memory Modules

These modules are used for custom engine information or for multi-engine information.

Cab2 Tan Modules

Base3 Firmware Update

What gets updated?

From time-to-time, Lionel will release firmware updates for the Base3. The Base3 has been designed in a way to allow you to update over Wi-Fi without having to use a memory module like the Base2 required or without having to send the Base3 to Lionel Service. Updating over Wi-Fi is called Over-the-Air updating, or OTA.

There are three separate processors or radios that you will be able to update:

1. Base3 Firmware. This is the heart and mind of the Base3. The core operating code. This firmware will be updated for bug corrections and to implement new features.
2. Wi-Fi Radio: This connects the Base3 to a Wi-Fi equipped device such as a smartphone with the Cab3 APP or your PC using the B3SU. This will be the least-frequently updated item as updates would only be needed to maintain standard Wi-Fi protocols. This code comes directly from the Wi-Fi module manufacturer.
3. BLE Radio: This operates Bluetooth-equipped LionChief locomotives. This firmware may be updated for bug corrections and to implement new features.

The Base3 can be updated using the B3SU, which is covered on this page. It can also be updated using the Cab3 APP. For more info on that, click [here](#).

Note: If you are updating the Base3 using the Cab3 APP, the APP will download the latest firmware versions. If using the B3SU, you can download the latest firmware to your PC from the links below.

Update Message Board

- [Base3 Firmware 1.26](#)

by Dave Olson

August 26, 2024

Click the version link below to download the firmware to your PC.

Release Version **08262024 Base3 Release 1.26**

Base3 Firmware Version [1.26](#)

Base3 Firmware version table

Release Notes:

- Correct spelling error in BLE internal database
- Fixed direction toggle speed reset in BLE loco
- Allow BLE config updates needed for B3SU
- Allow RF config updates needed for B3SU
- Fix BCM to support base record writes needed for B3SU
- Add BTMAC address to ID2 database and ID4 database records for ESB protocol
- Change ID4 database management to use BTMAC to prevent duplicate entries
- Add additional decodes to echo over Wi-Fi to sync Cab2 and Cab3
- Correct sensor track update from clearing speed graph on user recording
- Add ESB readback for Road/Num/TSDB on ID2 "SET" to update Cabs
- Fix throttle updates on Cab2 that tended to cause speed graph to hop around

Additional notes:

- Base3 Version 1.26 is REQUIRED for using the Base3 System Utility (B3SU)
- No changes to Wi-Fi or Bluetooth firmware. Below versions are still current.
- [Base3 Initial Code Release](#)

by admin

January 2, 2024

Click the individual version links below to download the firmware to your PC.

Release Version	01022024 Base3 Initial Release
Base3 Firmware Version	1.22
Wi-Fi Firmware Version	39.00.008
Bluetooth Firmware Version	2.0.4

Base3 Firmware version table

Release notes: This is the initial release of all Base3 firmware. Future updates will include notes regarding bug fixes and newly implemented features. Check back periodically for updates.

Using B3SU to Update

Follow these instructions to update the firmware in your Base3. Pay close attention as each section is for a specific processor or radio.

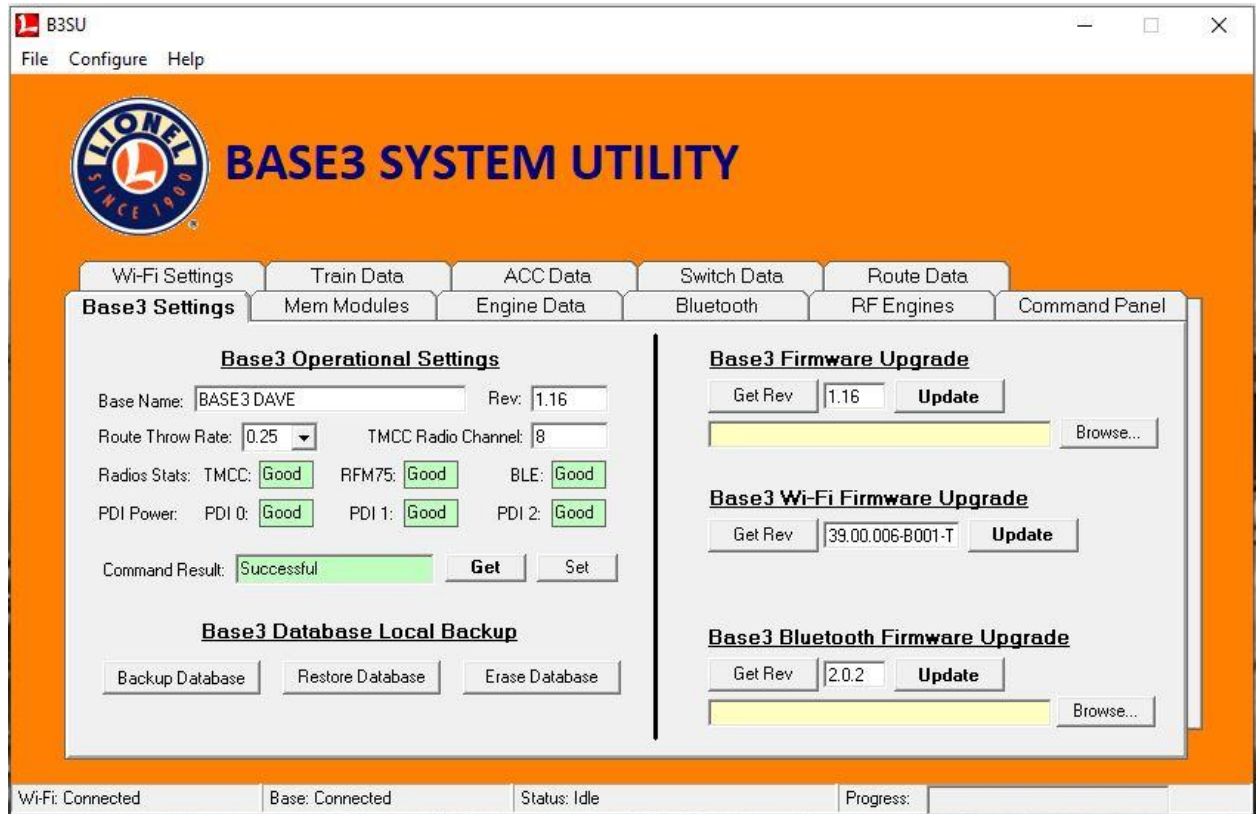
Base3 Firmware

1. Download the latest firmware to your PC from the link(s) above. While you can update to any version of the firmware that has been released, it is highly recommended to use the latest. Make sure you remember the file location where you downloaded the firmware to.
2. With the Base3's power off, slide its NETWORK/ACCESS POINT switch to ACCESS POINT. Firmware updates cannot be done over a network.
3. While holding down the bootloader button on the front of the Base3 (a gear symbol), power on the Base3. The LIONEL lights at the ends of the Base3 will slowly flash on and off to indicate that the Base3 is ready for updating.



4. Connect your PC's Wi-Fi to the Base3's ACCESS POINT.
5. Open the B3SU. If it does not automatically connect, click "Configure" and enter the Base3's default IP address, which is 192.168.111.1 and then click "OK".
6. Firmware is read and updated on the Base3 Settings tab, which is the default tab when you open the B3SU. On the right at the top under "Base3 Firmware Upgrade", the current firmware revision that is in the Base3 is shown. If it shows a number less than what's available to download from above, then it's time to update. If it is the same as what's above, then you do not

need to update at this time.



7. Click on “Browse...” and navigate to the new firmware file. Click on it and then click “Open”.
8. Click on “Update” and wait while the firmware is updated. You can monitor the update via the progress bar at the bottom right of the B3SU. Do not power off the Base3 or close the B3SU during the update. When the update is complete, the Base3 will automatically restart.
9. Reconnect your PC to the Base3 and open the B3SU. The new firmware version will be displayed.

Wi-Fi Firmware

1. Coming soon.

Bluetooth Firmware

1. Download the latest firmware to your PC from the link(s) above. While you can update to any version of the firmware that has been released, it is highly recommended to use the latest. Make sure you remember the file location where you downloaded the firmware to.
2. With the Base3’s power off, slide its NETWORK/ACCESS POINT switch to ACCESS POINT. Firmware updates cannot be done over a network.
3. Power on the Base3.
4. Connect your PC’s Wi-Fi to the Base3’s ACCESS POINT.

5. Open the B3SU. If it does not automatically connect, click “Configure” and enter the Base3’s default IP address, which is 192.168.111.1 and then click “OK”.
6. Firmware is read and updated on the Base3 Settings tab, which is the default tab when you open the B3SU. On the right under “Base3 Bluetooth Firmware Upgrade”, the current firmware revision that is in the Base3 is shown. If it shows a number less than what’s available to download from above, then it’s time to update. If it is the same as what’s above, then you do not need to update at this time.
7. Click on “Browse...” and navigate to the new Bluetooth firmware file. Click on it and then click “Open”.
8. Click on “Update” and wait while the firmware is updated. You can monitor the update via the progress bar at the bottom right of the B3SU. Do not power off the Base3 or close the B3SU during the update.
9. After the update finishes, your Base3 is updated and ready to go. You can double check the new firmware version using the B3SU.

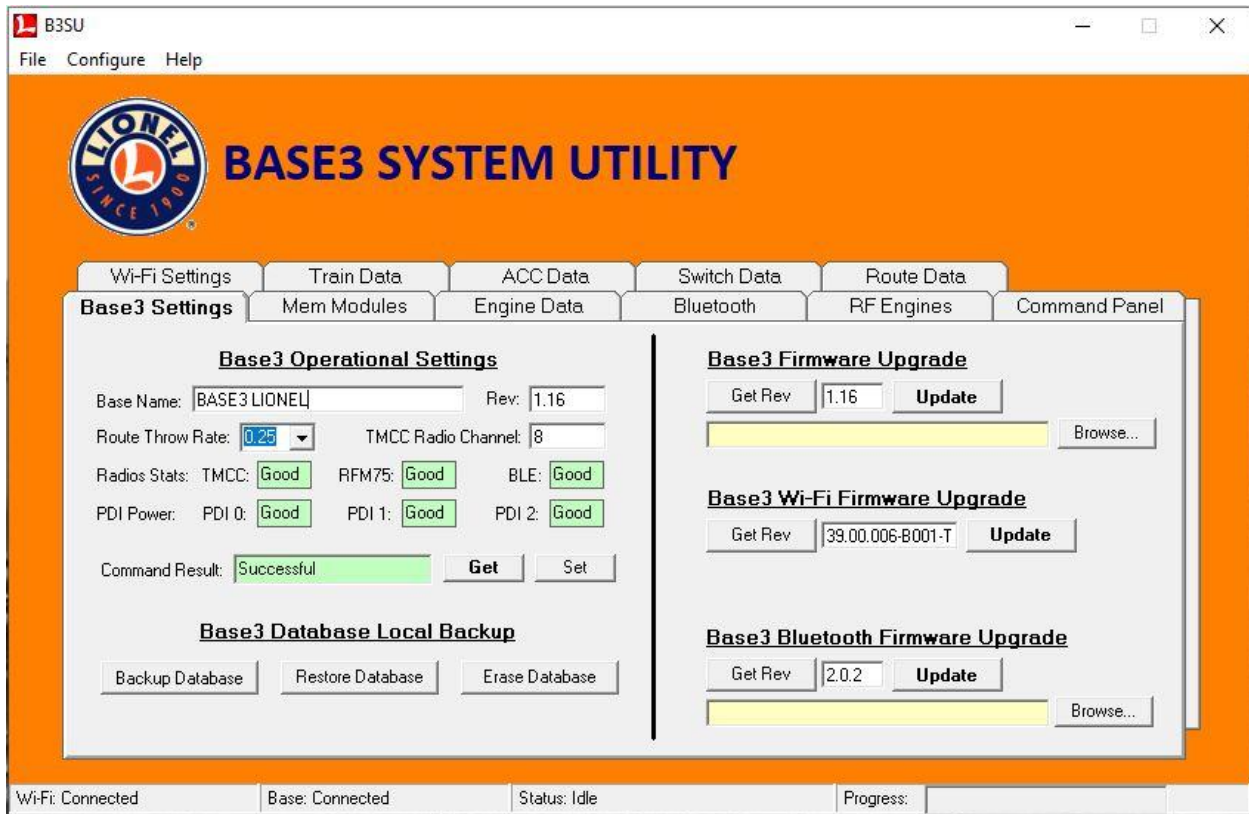
Base3 System Utility

The Cab3 APP allows for complete Base3 configuration. For those who choose to not utilize the Cab3 APP, Lionel offers a Windows-based program that provides the same configuration utilities. The Base3 System Utility connects to the Base3 via Wi-Fi, allowing you to communicate to the Base3 with the click of a mouse.

The B3SU provides many functions:

- Base3 settings and status:
 - Change the Base3’s name, route throw rate, and TMCC radio channel.
 - View the Base3’s firmware revision.
 - View the status of the Base3’s various radios and PDI ports
 - Save/restore a local copy of the Base3’s database
- Base3 firmware updater:
 - Update the Base3’s core firmware
 - Update the Wi-Fi module firmware
 - Update the Bluetooth module firmware.
- Memory module support:
 - Create a Cab2 firmware module

- Backup and restore the Base3's engine database
 - Import your Legacy Base2's engine database.
 - Create engine-specific memory modules or multi-engine modules
- Engine roster:
 - View/change road name, road number, locomotive type, control type, sound type, and basic light settings
 - Support for both 2-digit and 4-digit engine rosters
- Bluetooth LionChief engine settings:
 - View programmed engines, pair a new engine, or remove an existing engine
- RF LionChief engine settings:
 - View programmed engines, pair a new engine, or remove an existing engine
- TR data:
 - View and edit trains/lash-ups saved to the Base3's database
- ACC data:
 - View and edit accessories saved to the Base3's database
- SW data:
 - View and edit track switches saved to the Base3's database
- RTE data:
 - View and edit routes saved to the Base3's database
- Wi-Fi settings:
 - Configure the Base3 Wi-Fi connection
 - View Wi-Fi firmware revision
 - Set a SSID and password for a secure Wi-Fi connection
- Command Panel:
 - A simplified command panel for controlling engines from your PC. While this tool cannot do everything that a Cab2 or Cab3 APP can do, the basic functions allow you to test changes made while using the B3SU



B3SU Homescreen

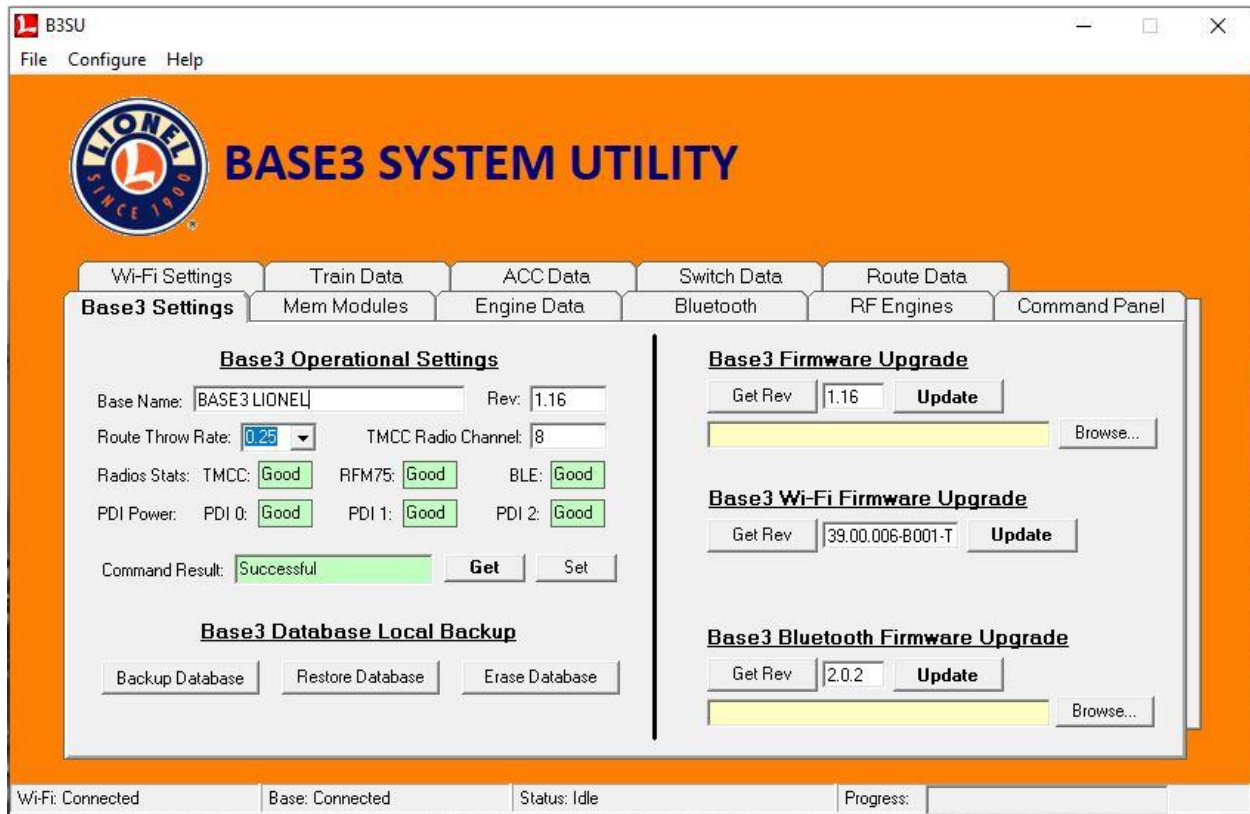
Download the B3SU: **coming 9/1/2024** – sorry for the delay! We’re making it great!

Base3 Internal Diagnostics

The Base3 supports various diagnostics at power up and during operation. Problems monitored include PDI port power, the failure of a radio or serial connection component, or an unexpected behavior such as failing to associate to an Access Point in Network mode.

The common indication for an error is the breath lights, which start to flash rapidly. These are the blue “LIONEL” lights at both ends of the Base3. Normally they ramp up and down slowly to indicate all systems are normal. The “Gear” button on the front of the Base3 can be used to silence the flashing of the breath lights; however, a power cycle will return the flashing if the error persists.

The [B3SU](#) is used to identify the detailed error condition. After the PC has been connected to the Base3 and the B3SU is started, click “GET” to import the Base3’s information. The various radios and serial ports are listed. Their status is normally indicated by a green box with the word “Good”. If any issues are present, that box will turn red with the word “Bad”. The information in the following sections can help troubleshoot the problem.



B3SU Homescreen – note green “Good” indications for various Base3 components

The 4 Error Classes

The following four classes are what the Base3 continually monitors for faults:

1. LCS PDI port power loss
2. Failure on a serial port or RF, BLE, TMCC radio
3. Failure of the Wi-Fi radio
4. Serial port data integrity errors

Note: The Wi-Fi radio is in a separate class of error from the other radios because the RF, BLE, and TMCC radio error details are obtained over the Wi-Fi interface.

Error Classes and their reporting method

1. When a LCS PDI port has a power overload or loss, the power on that port is switched off, and the green light above that port is turned off. The power to the PDI bus is fused, and can be reset with a power cycle if the reason for the power loss was external. When LCS modules do not initialize on a particular PDI port, check the power light on the back of the Base3. To recover, turn off the Base3, unplug that LCS module chain from the Base3, and turn on the power. If the light above the problematic port turns on, then check the modules and their interconnect wires. If the light above the problematic port does not turn on when nothing is plugged into the PDI port, the Base3 needs to be serviced.

2. When an RF, BLE or TMCC radio fails, the breath lights will flash rapidly. Use the B3SU to check the problem cause. The failed radio(s) will be identified. The breath lights can be temporarily restored to the normal slow ramping by pressing the “Gear” button. The Base3 will need to be serviced to correct the problem.
3. The Base3 has 4 Serial ports; USB, LCS1, LCS2, and LCS3. If any of these ports experience data corruption on an ongoing basis, the breath lights will flash rapidly. This diagnostic data is not shown on the B3SU. This condition is very rare, but nonetheless it is monitored. If the breath lights flash rapidly and the other monitored conditions do not show an error, it is likely there is a data integrity issue on the serial ports. A bad serial or PDI cable will normally be the cause of this error. The breath lights can be temporarily restored to normal by pressing the “Gear” button.
4. When the Wi-Fi radio fails, or does not have connectivity, the B3SU will not be able to connect. In this case the breath AND orange “L” logo will flash to indicate the problem source.

Wi-Fi Error conditions:

- If the Wi-Fi switch is set to AP mode, the Base3 will try to initialize in the AP mode. If the Wi-Fi does not initialize properly, the Base3 will flash the breath lights, and additionally the orange “L” logo lights will flash rapidly. The Base3 will need to be serviced to correct this type of problem as it indicates a hardware error.
- If the Wi-Fi switch is set to Network mode, and the Base3 was previously paired to a router, and the Base3 cannot establish connectivity with that router, the “L” logo lights will flash rapidly. The breath lights will not flash, as the Base3 is operating normally. The “Gear” button can be used to stop the flashing of the “L” logo lights.
- If the Wi-Fi switch is set to Network mode, and the Base3 has not been paired to a router, no lights will flash. This indicates the Base3 will need paired to a router. After placing the router in WPS mode, press the WPS button on the Base3. The “L” logo lights will sequence. If a connection is made, the green activity light will come on for 3 seconds and then turn off. If the green activity light does not come on and the “L” logo lights stop sequencing, the WPS pairing failed. You may try again, by pressing the WPS on the router, then on the Base3, and watch for the green light. After trying the sequence several times and the pairing is not established, the “L” logo lights will flash rapidly. The “Gear” button can be used to stop the flashing of the “L” logo lights. Power cycling is required in this situation to reset the Wi-Fi system.
- If the Base3 has previously been paired with a router and this is no longer desired, the user can clear the SSID and Password pairing by holding the WPS button before turning on the Base3. The “L” logo lights and the green light will flash alternately. Power cycle the Base3 again to establish normal operation.

