S-CAB Throttle User Guide

A simple wireless throttle for loco control

Switches, Buttons and Displays

- **Mode switch:** Selects either control mode (labeled 'CAB') for operating locos or service mode ('CV') for editing decoder configuration variables. In 'CAB' (or control) mode, S-CAB is a device for controlling trains. In 'CV' mode, it is a tool to edit (program) decoder configuration variables.
- **Throttle slider:** Controls loco by sending speed commands as the throttle moves. It is disabled in CV mode.
- **Direction switch:** Switch right sets forward direction, switch left sets backward direction. Direction is included in the speed command. Switch is disabled in CV mode.
- **Keypad:** Ten numeric keys and seven command buttons.

Format guide

'7', 'CV' are labels

L3 is what the LED displays

Loco# is a key or button press

{5207} is a loco number

[12] is a decoder ID

When S-CAB enters CV mode, commands are sent to decoders in service mode

Table 1 summaries command key actions. The display's most significant digit shows a character prompt, unless over-written by a 2-digit number.

Table 1. Keypad Commands

Button	Prompt	What it does
S-CAB in control (CAB) mode		
Loco#	***L***	**L**oco ID assignment and selection
Speed	***P***	Preset speed (**P**ower) steps
FG1	***F***	Loco **F**unctions F0 to F9
FG2	***I***	Loco **F**unctions F10 to F12 and Info
ALL	***A***	Broadcast commands (**A**ll decoders)
HALT	***H***	Emergency stop (**H**alt)
Enter/Send		Sends command or enters a number
S-CAB in service (CV) mode		
C#	***C***	Select a CV number (**#**)
C=	***U***	Enter a CV val**U**e
Enter/Send		Sends command or enters a number

Thinking of this as a command language makes command sequences more ntuitive. Try this example. In a situation of imminent disaster from run-away locos; use the sequence ALL, HALT to abruptly end the emergency.

When in control mode, it is okay to experiment. No combination of keypad entries, legal or otherwise, should cause the S-CAB to lock-up, freeze, or go blank. Illegal commands will not be transmitted; although legal, but unexpected, commands are possible. Keypad sequences with no associated action or command will generally display a character prompt followed by blank digit. For example, FG2, 6 will send no command, and will display ***I*** blank, since there are four unused commands in function group 2.

Worst case, turn S-CAB off and back on to reboot. This is not recommended during an operating session because reboot clears the operating loco roster from S-CAB's memory. However, you can reboot and immediately send ALL, HALT, or ALL, '0'.

In CV mode, a "push-any-button" technique is not recommended. CV numbers cannot be selected using S-CAB's number keys. Instead, S-CAB steps sequentially through the list of supported CVs with each click of C#. Once the desired CV is displayed, pressing C= locks the CV number and displays its suggested default value. Enter(Send) transmits the suggested value. Number keys can be used to edit a CV value before it is sent. As a further precaution, S-CAB will not send CV

values that may be legal for certain decoders but risk putting a decoder in a non-recoverable configuration. This also prevents programming the decoder with a configuration that is incompatible with S-CAB. For example, S-CAB uses 28 speed steps and will not allow a decoder to be configured for 14 or 128 speed steps.

Radio On Indicator (right-hand decimal point)

To minimize radio interference, S-CAB's transmitter turns on only for a fraction of a second (approx. 0.01 seconds) while sending a DCC control message. To increase reliability, each message is repeated four times, requiring a total transmission time of 0.04 seconds. The number of repetitions is specified in S-CAB's firmware and is not accessible by a user.

Since it can sometimes be helpful to watch radio activity, the display's right-most decimal point lights while S-CAB's radio is on. When commands fail, decoder radio reception is often the problem, so it helps to watch radio activity and determine that the command is being transmitted.

Firmware Version Display

To view S-CAB's firmware version number, press FG2 followed by number key 8 The latest version is 2.5.

Reversing Option

FG2, 7 toggles the reversing option. Option = 1, the default, retains the loco's speed setting when reversing direction. Option = 0 sets loco speed to zero when direction is changed.

Start-up Decoder Selection

S-CAB throttle is delivered with '3' as the default decoder ID. This can be customized using the following procedure.

Use Loco# to enter desired ID; for example '12'.

Press FG2, 9 display will show ***12***

Turn off throttle. It will now turn on with loco ID [12].

Charging S-CAB's Battery

S-CAB will operate for several days without recharge. The display's brightness is the first indication that recharge is necessary.

Recharge is slow, with a charging rate of 100 mA, which is compatible with PC USB sockets.

It's safe to allow the throttle battery to recharge overnight.

S-CAB Control (CAB) Mode

Adding Locos to S-CAB's Operating Roster

S-CAB can handle up to 15 active locos in an operating roster and can address loco decoder IDs from 1 to 99. It is more natural to identify models by loco or vehicle number, rather than decoder ID, but a decoder knows nothing about loco numbers. Long addresses (4-digit IDs) are not used by S-CAB.

A 4-digit loco number, {5245}, for example, can be assigned a short address (CV#1, Primary Address) of [45] or [5]. When Loco# is pressed, S-CAB displays the address of the active decoder.

The operating roster is a list of decoder IDs that S-CAB accumulates before, or during, an operating session. Each time a previously unused loco is selected, S-CAB adds that loco's decoder ID to a 'decoders-in-use' list and assigns memory (called "registers") where it saves commands sent to the decoder.

The first press of Loco# always displays the decoder ID of the active loco (the loco being controlled by S-CAB). Assigning a new loco to S-CAB's operating roster requires the command sequence:

Loco#, one or two number key-presses, Enter(Send)

For example, Loco#, 1, 2, Enter(Send) adds loco decoder ID number 12 to S-CAB's loco roster and immediately selects it as the active loco. The last key pressed performs 'Enter', because no command is sent to decoder [12]. S-CAB simply expands the loco roster and switches control to the new loco. A command will be sent as soon as the throttle is moved, or direction switched, or some other action is initiated by the user.

Switching Control between Locos

A convenient way to switch loco control uses Loco# to recall locos already in S-CAB's operating roster. As explained earlier, the first press of Loco# displays the active loco's ID. Each subsequent press steps through S-CAB's loco roster and continues to repeat the cycle with each key press. When the ID of the desired loco is displayed, it becomes the active loco. If attempting to operate two or more locos simultaneously, it helps to have only 2 or 3 locos in S-CAB's roster.

A key sequence such as: Loco#, 2, 5, Enter(Send), also changes the active loco ([25] in this example), but with a more complicated key sequence.

Speed Control

Loco speed can be controlled with slide throttle (which is always operational in control mode) or with numeric keys. The throttle uses 28 speed steps and is the preferred method of speed control.

When used with the Speed button, the numeric keypad provides 10 steps pre-defined speed steps which simulate notching for diesel locos. Step 1 is minimum speed which is useful when testing a loco's low speed performance. The Speed button always displays the last speed command sent to a loco by either throttle or

keypad action; a capability that is useful when operating more than one loco. Speed does not send a speed command until a number key is pressed, and the throttle can always be used to control loco speed.

Direction Control

Reversing Option 1: S-CAB does not change loco speed when sending a direction command. As with a real loco, it's best to bring the throttle to zero speed to stop the loco before changing direction. Otherwise, depending on the decoder's momentum settings, direction change with a non-zero speed may produce a sudden, unrealistic loco reversal.

However, it's okay to be lazy by setting the loco's acceleration and braking rates (momentum) to non-zero values and allowing the decoder do all the work of braking, stopping, reversing and accelerating the loco.

When operating this way, throttle position is consistent with loco speed, before and after direction change.

Reversing Option 0: S-CAB sends a zero speed command with change of direction. Depending on momentum, the loco slows to zero speed, changes direction and waits for a new speed command.

Loco Function Control

S-CAB provides 13 loco function commands numbered F0 thru F12.

FG1 uses keys 0 to 9 to control functions F0 to F9. This is the default keypad assignment at throttle startup.

FG2 uses keys 0, 1 and 2 to control F10, F11 and F12.

The following function assignments, which have become common practice among decoder manufacturers, are assigned to number keys 0, 1, and 2

F0: headlight on/off
F1: bell sound
F2: whistle or horn

S-CAB uses number key 5 as battery off command. Other key assignments depend on choice of decoder.

To send function commands, press FG1 or FG2 followed by a number key. Once selected, a function group remains active until the numeric keys are assigned to a different task. It's convenient to operate with the keypad assigned to function group 1, which includes frequently used functions.

Except for F2, each press and release of a number key toggles the corresponding loco function. Button '2' keeps F2 (whistle or horn) on when held down. (Down-on, Up-off).

Broadcast Commands

All DCC-compliant decoders must respond to commands with the global or broadcast address '0'.

In control mode, only three commands are appropriate for global addressing and the following commands are mandatory:

ALL, HALT	all loco emergency stop
ALL, 0	all loco reset
ALL, 5	all batteries off (requires decoder connection to BPS).

S-CAB Service (CV) Mode

First, some terminology is associated with programming decoder CVs. The oldest (and the most reliable) programming method uses a "programming track", which is an isolated section of track connected to the appropriate terminals of a DCC command station. Any loco with a decoder to be programmed is placed on the programming track.

Since, with S-CAB, there is no command station and no programming track, an equivalent method is provided called "global addressing".

Today's decoders generally support a technique called "Programming on Main" or "Ops Mode" which allows programming to be performed on any track connected to a DCC command station. The equivalent method with radio control is called "local addressing".

While most DCC manufacturers support "Programming on Main", implementation is inconsistent. Consequently, when "Programming on Main" fails, the reliable alternative is Programming Track. Similarly, with S-CAB, local addressing is convenient, but global addressing works with a larger selection of decoder products.

Global or Local Addressing?

All decoders must respond to global address ID = '0'. A local address will be recognized only by a decoder (or decoders) with matching address. Obviously, if local addressing works, it is a safer way to change CV values.

There are two reasons to use global addressing:

1. To deal with situations where a decoder's address is unknown. Rather than wasting time guessing, it's quicker to turn off all decoder radio receivers, except the decoder with unknown address, then use global addressing to set a new address.
2. There is no guarantee that all decoders support local addressing to program all CVs. If local addressing does not work, try global addressing, which is a mandatory requirement for compliance with NMRA RP 9.2.3.

Programming Procedure

S-CAB must be communicating with a decoder in control mode before switching to CV mode. The address of the active decoder defines the decoder that will receive configuration commands when using local addressing. A different decoder address cannot be selected once S-CAB is in CV mode.

If global addressing is used, the active address is irrelevant. However, it is best to check that a decoder is operating correctly before entering CV mode. If the decoder is not installed in a loco, connect to a motor and test with speed control. Most decoders acknowledge a CV command by pulsing the motor, which reacts with an observable jerk. Watch and listen for this response. This is not the case with SoundTraxx decoders

With global addressing, there is a risk of accidentally programming any decoder that receives the radio transmission. For this reason, local addressing is the default method when S-CAB is switched to CV mode.

Local Addressing

To continue programming with local address:

1. Begin with S-CAB controlling the target decoder.
2. Switch S-CAB to CV mode.
3. Follow CV programming steps described below.
4. When done, switch S-CAB back to CAB mode.

Global Addressing

To select global addressing, add an extra step to the procedure:

1. Begin with S-CAB controlling the target decoder.
2. Switch S-CAB to CV mode.
3. **Press the** ALL **button.**
4. Follow CV programming steps described below.
5. When done, switch S-CAB back to CAB mode.

Step 3 is the only difference in procedure and must be executed immediately after entering CV mode.

Detailed Programming Steps

Use global addressing to change a decoder's primary address,

- Switch to 'CV' mode. The CAB indicator LED (green) turns off, CV indicator (amber LED) turns on and the display shows ***C*** with blank second digit.
- Press ALL to select global addressing (display shows ***CA***)
- Press FG1 key. Display will show ***C1***.
- Press C= key. S-CAB displays ***U3***, where '3' is the default address value, and is not what we want. (Note the prompt, ***U*** for val**u**e.)
- Enter a number for the desired address; for example '8', S-CAB displays ***U8***.
- Press the Enter(Send) key. S-CAB display shows ***L8*** and the motor connected may jerk to acknowledge that the address change has been processed by the decoder.

- Return the Mode switch to its 'CAB' position. The amber CV indicator turns off, the green CAB indicator turns on, and the display continues to show ***L8***, which is now the active loco.

To change other CV values, press C# repeatedly until the desired CV number is displayed, then use the previously described steps. Table 2 lists industry-standard CVs supported by S-CAB.

Table 2. Supported CVs

CV#	Description	Entry Format
CV1	Primary address	1 or 2-digit number
CV2	Starting voltage	% full voltage
CV3	Acceleration rate	1 or 2-digit number
CV4	Deceleration rate	1 or 2-digit number
CV5	Maximum voltage	% full voltage
CV29	See Appendix 1	0 or 1

Throttles with version 2.5 firmware support SoundTraxx CVs; horn select (CV120), and sound volume (CV128). Since S-CAB display is 2 digits, display displays a decimal point instead of 1.

- CV120, displayed as ***2.0*** is horn select and is entered as number.
- CV128, displayed as ***2.8*** is sound volume; entered as a percentage.

For compatibility with S-CAB, new decoders should always be programmed using the default value of CV29. If the loco's movement is oriented incorrectly after installing the decoder, use CV29 to flip motor polarity so that a forward command produces forward movement.

Primary Address (CV1)

The S-CAB does not use long addresses or perform consist addressing. With radio, it is simpler to assign the same primary address to each loco in a consist. The individual characteristics of each loco in a consist can be changed by turning off receivers of other locos in the consist.

Start Voltage (CV2)

For NCE, try the default value (10%) to begin experimenting with a loco's starting performance. If it starts with an unrealistic jerk, reduce the value. If there is no sign of movement, increase the value.

For SoundTraxx, leave it at zero.

Acceleration (CV3)

'0' corresponds to no momentum and speed change commands produce instant response. Only a model can jump from zero to full speed in a fraction of a

second. For more realistic acceleration, begin experimentation with a CV value '4' for NCE decoders and '40' for SoundTraxx.

Deceleration (CV4)

Having determined a value for CV3, try the same value for CV4 or reduce it to have the loco brake more rapidly than it accelerates. For example, '3' for NCE, '30' for SoundTraxx.

Maximum Voltage (CV5)

Try the default value (90%) to begin experimenting with the loco's maximum speed. Since most locos run unrealistically fast at maximum voltage, reduce the value of CV5 for more realistic performance.

Decoder configuration (CV29)

Zero is the default setting. Change to '1' to flip motor polarity. (Reverse the motor's response to a direction command).

Configuring a New Decoder for S-CAB Compatibility

S-CAB requires a decoder configured as follows:

- Short address: 2 digits, 1 to 99, no extended addressing
- 28 speed steps: 5-bit speed command
- NMRA DCC power only: This prevents the decoder from sensing track or battery voltage as DC speed control.

Most new decoders do not comply with the foregoing requirements and typically interpret battery power as full-speed DC operation. The following procedure will help avoid unexpected behavior.

- Program CV29 by sending the default value; '0'. (For users familiar with CV29, the throttle transmits the value '2' for CV29, which configures the decoder for short address, 28 speed steps, 'F0' for headlight control, ***DCC power only*****,** default motor polarity.)

Appendices

1. CV29 Details (tech-talk)

Editing CV29 can be confusing, since each bit determines a separate decoder parameter. To keep things simple, S-CAB sets all parameters except Bit 0, which can be set to reverse polarity of motor output.

After installing a decoder, a forward command may cause the loco to go backwards. Instead of re-wiring to reverse motor connections, bit 0 of CV29 can be changed from its default value of '0' to the value '1'. This flips polarity of the decoder's motor output, which accomplishes the same result as swapping motor connections. However, be sure to check that operation of directional lighting is consistent with this swap.

The table below summarizes decoder default values of CV29 used by S-CAB. The 8-bit value sent to the decoder is '2' or '3', depending on the user's selection ('0' or'1') for motor polarity.

Bit	Description	Default	Comment
Bit 0	Motor polarity	0	0 = normal polarity 1 = reversed polarity
Bit 1	Headlight control, number of speed steps	1	Function group 1, bit 4 controls headlight. Use 5 speed bits, 28 speed steps
Bit 2	Power source	0	NMRA digital only
Bit 3	Communications	0	Bi-directional communication disabled
Bit 4	Speed table	0	By default, speed table is determined by CVs 2, 5 and 6
Bit 5	Addressing	0	7-bit addresses
Bit 6	Future	0	No used
Bit 7	Decoder type	0	Loco decoder

Throttle and Direction Inconsistencies

When switching control between locos, throttle and/or direction switch positions may not be consistent with the state of a newly selected active loco. Assume, for example, an active loco is running at speed step 16 and forward direction when control is switched to a different loco, which is stationary.

Changing active loco sends no command, but suppose the new active loco is stationary and we want it to run backwards. Since S-CAB's throttle is at speed step 16, not zero, and the direction switch is forward, we have an inconsistency. Just be prepared to move the throttle quickly to zero, then change direction. (This is where the zero-speed reversing option 0 can be helpful.)

The HALT button sends emergency stop but leaves direction unchanged. However, the throttle is most likely not at zero speed.

Supported Decoders: Updated December 2025

NCE decoders

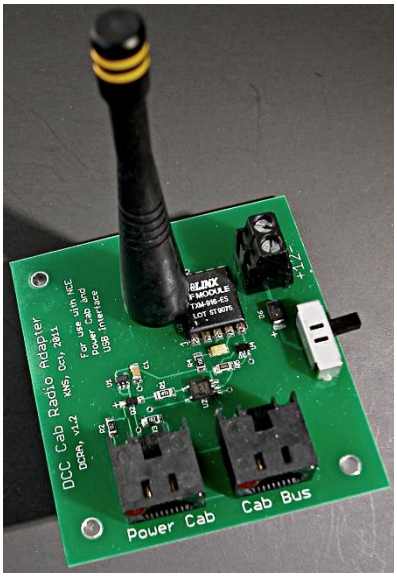
- Models D13J, D16MTC, D408SR.
  S-CAB programs successfully with both Local and Global addressing.

SoundTraxx decoders

- TSU-2200, TSU-1100, BLU-2200
- ECO-21PNEM, TSU-21PNEM,
- BLU-21PNEM

Programming SoundTraxx decoders with S-CAB requires Global addressing.

Vendor-Specific CVs



S-CAB is not designed for programming vendor-specific CVs. It is intended for loco control and can be used to program a few CVs that are important for loco operation.

Several options are available for universal CV programming:

- An S-CAB Radio Programming Adapter (RAPA) is a good option for users already invested in NCE equipment, including in some cases NCE's computer interface and use of computer apps such as JMRI DecoderPro.
- S-CAB operating at 918.12 mHZ is compatible with channel 11 on CVP Products J-6000 throttle which has good programming capability.
- SoundTraxx Blunami decoders are the latest and best option for managing CVs but are a proprietary solution with high cost per loco.