

ProtoThrottle

Realistic Control Stand Throttle

MANUAL



IOWA SCALED ENGINEERING – ELECTRONICS MADE EASY!

www.protothrottle.com

Thank you for purchasing the ProtoThrottle.

Our goal was to design and develop a wireless throttle that provides the diesel modeler with the most realistic experience operating their model locomotives.

The ProtoThrottle mimics a standard EMD control stand including full detent throttle and reverser handles, a spring-loaded horn handle, a push-on/push-off bell button, and fully programmable front and rear headlights with a setting for ditch lights. In addition, the ProtoThrottle comes with a robust faceplate machined from aluminum, including prototype bezels, and anodized to give the look and feel of a real control stand.

The ProtoThrottle comes with our commitment to your satisfaction. We warranty the throttle from manufacturing defects for one year, and if you should have any questions or issues with the ProtoThrottle, please contact us.



Scott Thornton



Michael Petersen

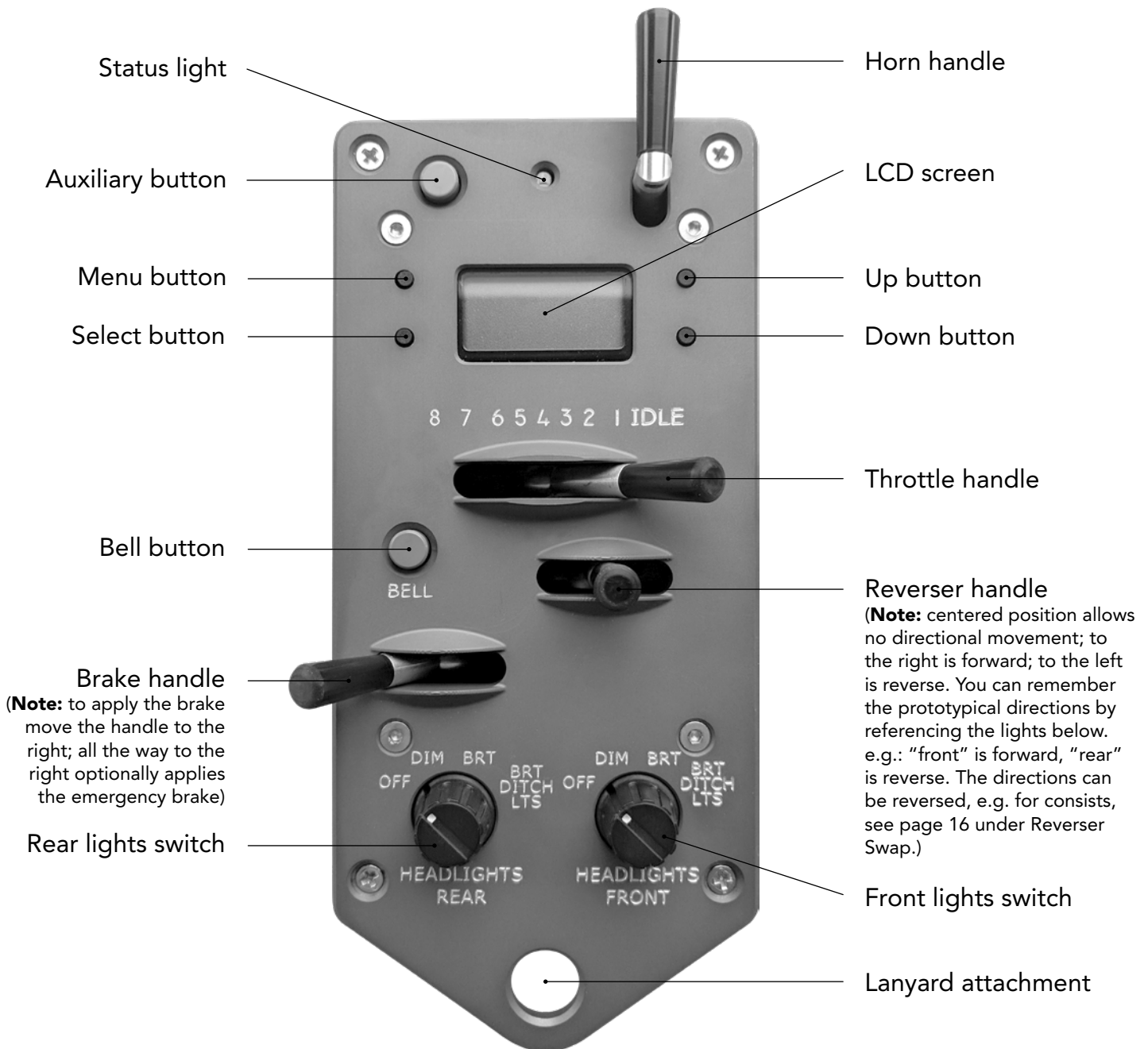


Nathan Holmes

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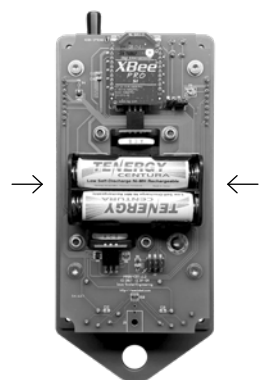
ProtoThrottle Controls & Battery Install



The ProtoThrottle is powered by 2 AA batteries (not included). The batteries can be alkaline or rechargeable NiMH.

To access the battery holder, unscrew the 4 phillips head screws on the corners of the throttle's faceplate; remove the box; **IMPORTANT:** when removing the batteries from the holder, use one hand to hold **both** sides of the holder to prevent it from bending away from the printed circuit board; insert batteries and reattach the box. **Do not over tighten the screws.**

To conserve battery life: make sure the throttle handle is in "idle" position and the reverser handle is in "centered" position when not in use. This will cause the throttle to go to sleep after 5 minutes. **To power down manually, see the instructions on page 6.**



Quick Start Guide

The ProtoThrottle will work with any scale and with sound- or non-sound decoders (though using sound enhances the control stand experience significantly). Any DCC decoder compatible with the NMRA standards will work with the ProtoThrottle because it uses standard DCC commands and functions via your command station.. The ProtoThrottle is not a DCC system and will not replace the system you use.

Check the Iowa Scaled Engineering website for the most current list of supported DCC command stations: www.iascaled.com

NOTE: if the ProtoThrottle is in "sleep" mode the LCD screen will be dark, click any of the LCD buttons to wake the throttle.

1

1. Configure your ProtoThrottle receiver using the instructions provided with the receiver.
2. Make sure the base address of the ProtoThrottle matches that of the receiver. (See page 18.)
3. If using multiple ProtoThrottles, set each throttle to a unique ID. (See page 18.)

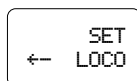
2

Using your DCC system, **set acceleration momentum (CV3) mid-range to moderately high** so that the ProtoThrottle will need to "notch up" to get the train moving.

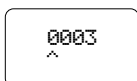
Set deceleration momentum (CV4) high or maximum. This will allow the train to "coast" when the throttle is in the idle position requiring the use of the brake to slow or stop the train.

3

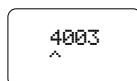
Input the locomotive number into the ProtoThrottle:



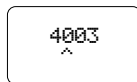
1. Click the Menu button 5 times



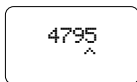
2. Click the Select button once



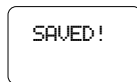
3. Use the Up and Down buttons to change numbers



4. Use the Menu button to move cursor right



5. After number is input, click Select button to save



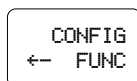
NOTE: see page 10 for how to set a short (primary) address.

5

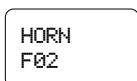
NOTE: the ProtoThrottle function settings are set to standard DCC function numbers by default. If you need to change any function number, the steps are explained below:

4

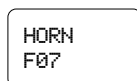
To check or set the horn, bell, and brake function numbers:



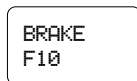
1. Click the Menu button 7 times



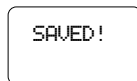
2. Click the Select button once



3. Click the Up or Down button to change the function number



4. Click Menu button to toggle through the other function choices. Repeat step 3 to change additional function numbers.



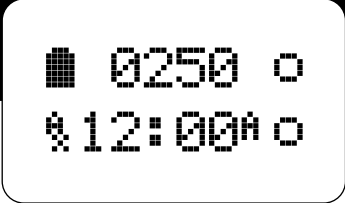
5. Click the Select button to save all changes

5

Enjoy operating your locomotive!

Please read the entire manual to familiarize yourself with all the features of the ProtoThrottle. See our website for more specific instructions on programming.

In addition, our website has detailed operational scenarios developed by professional locomotive engineer, Tim Garland. If you are not familiar with prototype operation from an engineer's perspective, Tim's scenarios will give you insight on how to operate more realistically using the ProtoThrottle.



ELEMENT

DESCRIPTION

0250

Locomotive Address. Long (extended) addresses are displayed directly (e.g. 0250 0000 9999). Short (primary) addresses are displayed with an 's' prefix (e.g. s003 s000 s127).

In certain situations the locomotive address may be replaced by an alert message:
EMRG Emergency stop is active!
Note: move the brake handle all the way left to deactivate.
REV! Reverser was moved with the throttle not in idle

12:00^A

The ProtoThrottle acts as a secondary display for Iowa Scaled Engineering's wireless fast clocks www.iascaled.com/store/MRBW-FCM or the fast time provided by the NCE Cab Bus.

^A 12-hour mode AM indicator ^P 12-hour mode PM indicator

No AM or PM indicator when in 24-hour mode.



Battery Status: Batteries good Batteries low Replace batteries
Display will show LOW BATTERY when the batteries are critically low. Operation will not be possible until the batteries are replaced.



When "AX" is on screen the auxiliary button is active



Up/Down Button Status. On the main screen, the Up and Down buttons can be assigned to functions. The on/off status of those assigned functions are displayed on the LCD screen.

Function off
 Function on

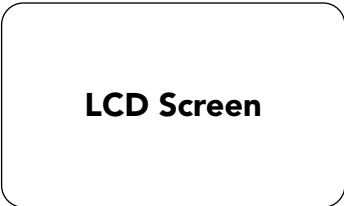
Note: pressing and holding the Menu button (upper left LCD button) momentarily will return you to the main screen from any of the main menus.



Click "down button" to turn off throttle

Advance to Engine Menu

Toggle backlight on/off;
hold to power down throttle



Up



Down

NOTE: these buttons can be assigned a function using the Configure Function menu

DESCRIPTION

The behavior of the Engine menu depends on the configuration of the **ENG ON** and **ENG STOP** settings in the **Configure Function menu**. For DCC decoders that take a single function on/off to turn the prime mover on/off (such as ESU Loksound or TCS WOWSound decoders), configure **ENG ON** to that function number and set **ENG STOP** to off (F--). The Engine menu will then change between OFF and ON when pressing the Up and Down buttons.

ENGINE
OFF

ENGINE
ON

If a decoder is edge triggered instead (requires a function on/off transition) to turn the prime mover on and off (such as Soundtraxx Tsunami2), set both **ENG ON** and **ENG STOP** to the appropriate function numbers. In this case, the Engine menu will display **STARTING** and **STOPPING** between the **ON** and **OFF** settings as the assigned functions are sent to the locomotive decoder.

ENGINE
OFF

ENGINE
STARTING

ENGINE
ON

ENGINE
STOPPING

ENGINE
OFF

If the throttle is not in idle when attempting to turn off the prime mover, a warning will be displayed and the **ENG STOP** function will not be sent. Move the throttle back to idle to continue.

ENGINE
NOT IDLE

Example #1, F8 for ESU Loksound or F12 for TCS WOWSound:

ENG ON = F08 ENG ON = F12
ENG STOP = F-- ENG STOP = F--

Example #2, F5 (on, RPM+) and F6 (off, RPM-) for Soundtraxx Tsunami 2:

ENG ON = F05
ENG STOP = F06

Advance to Tonnage Menu

Return to Main Screen

LCD Screen

Start or turn on prime mover

Stop or turn off prime mover

Special Functions Menu

SPECIAL
← FUNCS

Advance to Load Configuration Menu



LCD Screen



None

Enter Special Function Sub-Menu



None

Special Function Sub-Menu

BRAKE
TEST →

ELEMENT

DESCRIPTION

BRAKE TEST

Enter Brake Test mode

8

None



LCD Screen



None

Return to Main Screen



Begin Selected Special Function

What is a brake test? (Note: this is a simplified explanation of train air brakes)

After an engine couples up to a string of cars and the air hoses are connected, the engineer and conductor will usually perform a brake test to ensure there are no air leaks, the pressure drop reaches the end of the train, and the air pressure through the brake lines is adequate. Each car in the train has a reserve air tank that is pressurized to apply the brakes. When the air pressure through the train line is approximately 90 psi, a valve on each car closes off the reserve air tank thus keeping the car free rolling. When the train line air pressure is **reduced** it causes the valve in each car to open releasing the pressurized air from the reserve tank thus applying the brakes. This process is called a "failsafe" because if the train loses its train line pressure the train will automatically brake. A brake test is performed when the engineer reduces the train line pressure by approximately 20-26 psi thus applying the brakes and the conductor visually confirms the brakes being applied. To simulate this test with the ProtoThrottle, follow the steps below (**note:** the time is user-variable):

1. Release the brake handle and watch the pressure build to its maximum of approximately ~89-91 psi (*air is simulated increasing into the train line; compressor sound is playing*).

2. Perform the brake test by moving the brake handle to the right. A 26 psi reduction will show on the gauge. (*air is simulated reduced through the train line; air letoff sound plays*).

3. Release the brake handle and let the pressure return to the maximum (*compressor sound starts; once ~90 psi is reached the compressor will silence*).

4. Press the "Return to Main Screen" key to return the throttle to normal operation and the train can now be moved.

Load / Save Configuration Menus

LOAD CNF
01: 0250

SAVE CNF
01: 0250

LOAD CNF: Advance to SAVE CNF
SAVE CNF: Advance to Set
Locomotive Menu

Load selected configuration
(and return to Main Screen) or
Save current configuration
(and return to Main Screen)

LCD Screen

● Increase configuration number

● Decrease configuration number

LOAD CNF
01: 0250

SAVE CNF
01: 0250

Load / Save Configuration Sub-Menu

ELEMENT

DESCRIPTION

LOAD CNF
01: 0250

01: Configuration Number. Up to 20 distinct configurations (locomotive address, function mappings, throttle notch settings, options) can be stored in the ProtoThrottle and loaded quickly using this menu.
0250 Locomotive Address. This is the locomotive address associated with the selected configuration number.

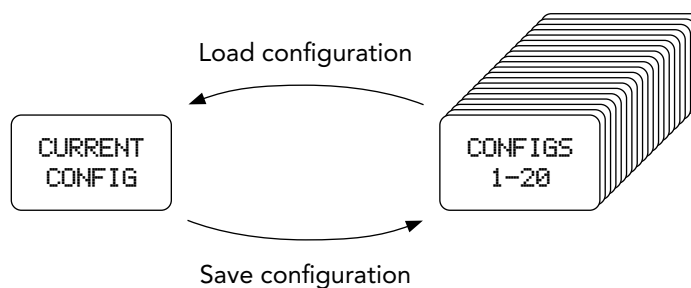
SAVE CNF
01: 0250

Save Configuration screen saves the **current loaded configuration** (with any changes you've made) into whatever configuration slot is on the screen. In order to copy an established configuration, you must load it into the throttle first before "saving" it to another slot.

CONFIRM
LOAD? →

Both the Load Configuration and Save Configuration functions will ask you to confirm before executing by pressing the Down button. To cancel, click the Menu button.

CONFIRM
SAVE? →



Set Locomotive Menu

← SET
LOCO

Advance to Force Function Menu ●

Enter Set Locomotive Sub-Menu ●

LCD Screen

● None

● None

Set Locomotive Sub-Menu

0250
^

ELEMENT	DESCRIPTION
---------	-------------

0250

Locomotive Address.

^

Digit Selector.

Move Digit Selector to the next digit ●

Save locomotive address and return to Set Locomotive Menu ●

LCD Screen

● Increase selected digit.

● Decrease selected digit.

NOTE: To set a short (primary) address, the first digit will need to display an "s". To do so, make sure the other three digits are first set to a valid short address value (<128). Then, cycle through the first digit until the "s" appears.

Force Function Menu

← FORCE
FUNC

Advance to Configure Function Menu ●

Enter Force Function Sub-Menu ●

LCD Screen

● None

● None

NOTE: The Force Function menu allows any of the 29 standard DCC functions to be turned ON or OFF, regardless of any other ProtoThrottle lever or button. These can be used to test functions or control additional features of the decoder such as auxiliary, class, or lesser used lights.

F00 ---

Force Function Sub-Menu

ELEMENT

DESCRIPTION

F00

Function Number. Available range from function 0 to function 28.

--

Function Setting.

---- Function can be controlled by a ProtoThrottle button or lever

ON Function forced on, regardless of any other button or control

OFF Function forced off, regardless of any other button or control

Cycle through Function Numbers ●

Save function settings and return to
Force Function Menu ●

LCD Screen

● Cycle through Function Settings

● Cycle through Function Settings

NOTE: In the Force Function menu, the horn lever does not activate the horn function. Instead, it will activate the currently selected function number if the function setting is ---.

Configure Function Menu

CONFIG
← FUNC

Advance to Notch Configuration Menu



LCD Screen



Up

Enter Configure Function Sub-Menu



Down

Configure Function Sub-Menu

HORN
F02

ELEMENT

DESCRIPTION

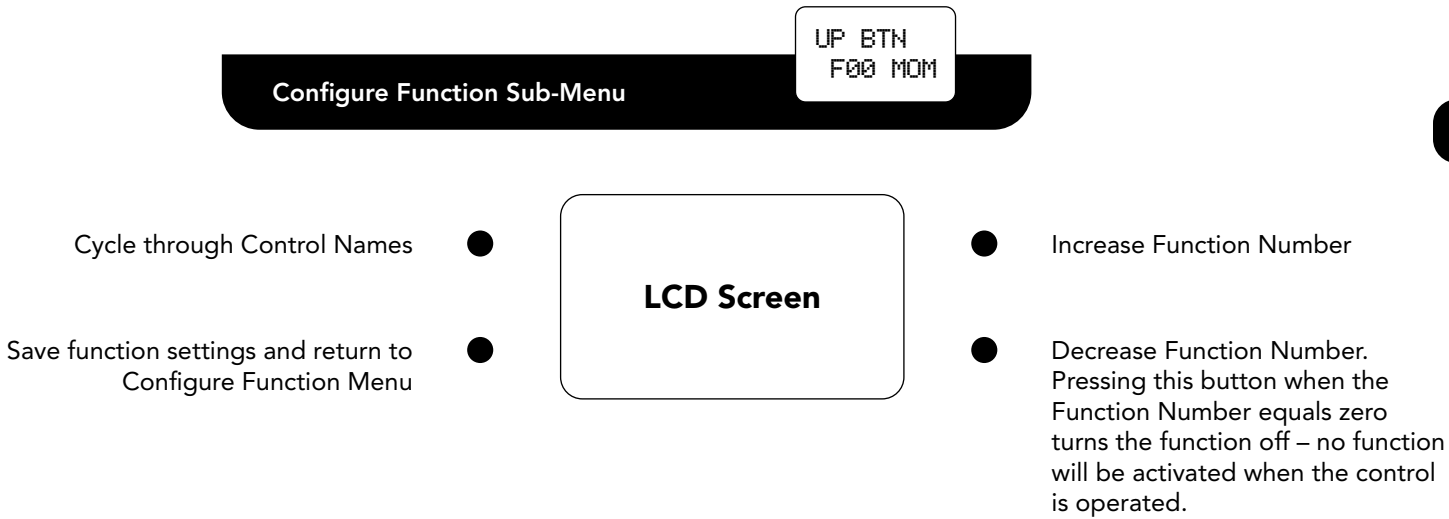
HORN

Control Name. The name of the ProtoThrottle button or handle to which a function can be assigned.

- HORN Horn lever
- BELL Bell button
- BRAKE Brake lever, when brake is activated
- BRK OFF Brake lever, when in the full left position
- AUX Aux button
- ENG ON Prime mover ON/start function (see Engine menu for details)
- ENG STOP Prime mover stop function (see Engine menu for details)
- THR UNLK Function which, when active due to another control, allows the throttle to send speed commands when the reverser is in centered position. (e.g. Loksound Drive Hold)
- REV SWAP Function which, when active due to another control, flips the direction of the reverser
- CENTERED Reverser center position
- ALERTER Function activated when the alerter timer is about to expire
- COMPRSR Compressor sound for the brake test mode
- BKR TEST Brake test (air release sound)
- F.HEAD Front headlight; active in the Bright and Ditch Lights settings
- F.DITCH Front ditch lights; active in the Ditch Lights setting
- F.DIM #1 Front dim headlight function #1; active in the Dim setting
- F.DIM #2 Front dim headlight function #2; active in the Dim setting
- R.HEAD Rear headlight; active in the Bright and Ditch Lights settings
- R.DITCH Rear ditch lights; active in the Ditch Lights setting
- R.DIM #1 Rear dim headlight function #1; active in the Dim setting
- R.DIM #2 Rear dim headlight function #2; active in the Dim setting

Continued on next page

	UP BTN Main screen Up button
	DOWN BTN Main screen Down button
F00	Function Number. The function to be activated when the associated ProtoThrottle button is pressed or control is moved. Available settings are none (F--) and functions 0 (F00) to 28 (F28).
MOM	Momentary / Latching Function. Only appears for the Up and Down button assignments. MOM Momentary – the function is only active while the button is pressed LAT Latching – the function toggles on and off with each press of the button
EMRG BRK	Activate the emergency brake. Only appears for the Up and Down button assignments.
BRK TEST	Active the brake test special function. Only appears for the Up and Down button assignments.



Notch Configuration Menu

← NOTCH
CFG

Advance to Options Menu



LCD Screen



None

Enter Notch Configuration Sub-Menu



None

Notch Configuration Sub-Menu

NOTCH #
102

ELEMENT

DESCRIPTION

#

Notch Number.

102

Speed Step. The speed step to send when the throttle is in the selected Notch Number. Range from 1 to 126 (128 speed step mode only). Idle is always speed step zero.

14

Cycle through Notch Numbers



LCD Screen



Increase Speed Step

Save notch settings and return to
Notch Configuration Menu



Decrease Speed Step

Options Menu

OPTIONS



Advance to System Menu



LCD Screen



None

Enter Options Sub-Menu



None

VAR BRK
ON

Options Sub-Menu

ELEMENT

DESCRIPTION

VAR BRK
OFF

Variable Brake. When set to ON, the brake effect will be proportional to the brake handle position. It is recommended to disable the emergency brake when variable braking is enabled. When set to OFF, the brake will be a simple on/off function.

BRK TYPE
PULSE

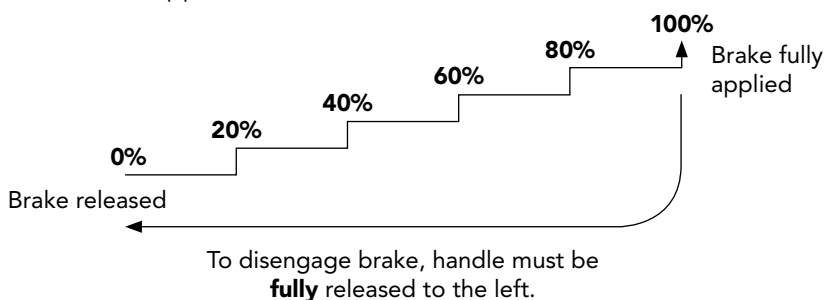
NOTE: Only displayed if variable brake is ON

Brake type:

- PULSE braking
- STEP braking (works with TCS WOWSound function)

Pulse braking. The brake function will be pulsed at a duty cycle corresponding to the brake handle position, simulating varying amounts of braking force.

Step braking. This feature is for use with TCS WOWSound decoders only. As the brake handle is moved to the right, a greater percentage of the brake is applied.



NOTE: the only way to disengage the brake is to fully release the brake handle completely to the left. Also, the emergency brake feature must be disabled for step braking to work correctly.

Continued on next page

Options Sub-Menu

ELEMENT

DESCRIPTION

BRK RATE
0.5s

NOTE: Only displayed if variable brake is **ON** and brake type is **PULSE**

BRK ESTP
ON

REV SWAP
OFF

Brake Pulse Rate

This sets the rate (0.2-1.0 second) at which brake commands are sent during pulse braking. A smaller value results in smoother braking but can result in a less responsive DCC system due to more commands being sent on the throttle bus.

E-Stop on Brake Handle. When set to ON, the brake handle can set emergency stop for the selected locomotive when moved completely to the right. When set to OFF, the brake handle will not cause an emergency stop to be set.

Reverser Swap. When set to ON, the reverser directions are swapped. This can be used to correct for a locomotive whose direction is set incorrectly or when changing the leading end of a back-to-back consist. When set to OFF, the reverser directions are normal.

Cycle through Options



Save setting and return
to Options Menu



LCD Screen



Increase or set option value



Decrease or set option value

System Menu

SYSTEM



Advance to Communication
Configuration Menu



LCD Screen



None

Enter System Sub-Menu



None

MENU LCK
ON

Options Sub-Menu

ELEMENT

DESCRIPTION

MENU LCK
OFF

When set to ON, only the following menus are available: ENGINE, TONNAGE, LOAD CNF, SET LOCO, FORCE FUNC, and SYSTEM.

ADV FUNC
OFF

When set to ON, advanced functions in the throttle are enabled. These include the Threshold Calibration menu and the Transmit Interval and Transmit Holdoff settings in the Preferences menu.

BAT OKAY
2.2V

Battery OK Voltage. The voltage above which the batteries are considered good. 🔋

BAT WARN
2.0V

Battery Warning Voltage. The batteries are low when the voltage is between the OK and Warning levels. 🔋

BAT CRIT
1.8V

The batteries need to be replaced when the voltage is between the Warning and Critical levels. 🔋

NOTE: When the voltage falls below the Critical level, **LOW BATTERY** will be displayed and operation of the throttle will not be possible.

Communication Configuration Menu

← COMM
CFG

Advance to Preferences Menu

LCD Screen

None

Enter Communication
Configuration Sub-Menu

None

Communication Configuration Sub-Menu

THRTL ID
A

ELEMENT

DESCRIPTION

THRTL ID
A

Throttle ID. Set each throttle to a unique ID using letters A-Z

BASE ADR
00

Base Address. Set to the address of the ProtoThrottle receiver – see receiver instructions.

TIME ADR
BASE

Time Source Address. Selects the fast time source. Set to "BASE" to display time information received from the command station by the ProtoThrottle receiver. To use an Iowa Scaled Engineering Wireless Fast Clock Master, set to the Node Address of the clock (0x01 to 0xFE). Set to "ALL" to display any time information received by the ProtoThrottle. The "ALL" setting works well with a single receiver in a private setting, but may result in erratic time display when multiple ProtoThrottle receivers are in close proximity (e.g. a public train show).

TX INTVL
1s

Transmit Interval. Time between periodic wireless transmissions to the ProtoThrottle receiver. This setting can only be changed if Advanced Functions are ON in the SYSTEM menu.

TX HLD OF
0.15s

Transmit Holdoff. Minimum time between wireless transmissions to the ProtoThrottle receiver. This setting can only be changed if Advanced Functions are ON in the SYSTEM menu.

Cycle through Address/ID Names

LCD Screen

Increase

Save Address/ID settings and return to
Communication Configuration Menu

Decrease

Preferences Menu

PREFS



Advance to Diagnostics Menu



LCD Screen



None

Enter Preferences Sub-Menu



None

Preferences Sub-Menu

ELEMENT

DESCRIPTION

SLEEP
DLY: 5M

Sleep Delay. Time until the throttle automatically enters low power mode. The throttle handle must be in idle, the reverser handle in centered position, and no buttons or controls actuated for this time. Range from 1 to 99 minutes.

ALERter
DLY: 60s

Alerter Delay. Maximum time allowed without moving any controls. Ten seconds prior to this time, the LCD screen will flash and display ALRT. The Alerter function will also be activated. To cancel the alerter, move and lever or push any button. If the time expires without any lever being moved or button pressed, the speed will be set to zero and the brake function activated. To then reset the alerter, place the throttle in idle and center the reverser.

TIMEOUT
CLK: 10s

Clock Timeout. Maximum time between fast clock time packets. If no time information is received in this interval, the clock display will show dashes to indicate it has lost communication with the fast clock master. Range from 1 to 25 seconds.

PUMP
RATE: 4

Pump Rate. Pumping rate in the brake test special function. Total pumping time can be varied from ~8 seconds to 2 minute 45 seconds. A setting of 4 is approximately 35 seconds.

LED BLNK
ON

LED Blink. When set to ON, the LED on the ProtoThrottle will blink green when communication with a ProtoThrottle receiver is active. When set to OFF, the LED will remain off when communication is active. The LED will always blink red when no communication link has been established.

Continued on next page

Preferences Sub-Menu

ELEMENT

DESCRIPTION

REV LOCK
ON

Reverser Lock. When set to ON, the reverser can only change the locomotive direction when the throttle is in idle, just like the prototype (in fact, on the prototype, the reverser handle is locked and cannot be moved). If the reverser is moved when the throttle is not in idle, the direction will remain the same and the Main Screen will display **REV!**. When set to OFF, the reverser is allowed to change the locomotive direction regardless of the throttle setting.

STRICT
SLP OFF

Strict Sleep. When ON, the reverser must be centered for the throttle to automatically go to sleep. When set to OFF, the reverser position does not matter and the throttle will go to sleep with the reverser in any position.

Cycle through preference settings



LCD Screen



Increase value or turn on setting

Save preference settings and
return to Preferences Menu



Decrease value or turn off setting

Threshold Calibration Menu

THRESHOLD
← CAL

Advance to Diagnostics Menu



LCD Screen



None

Enter Threshold Calibration Sub-Menu



None



NOTE: These settings are factory calibrated and do not, under most circumstances, need to be changed. Modify them at your own risk!

NOTE: Only displayed if Advanced Functions are **ON** in the **SYSTEM** menu

Threshold Calibration Sub-Menu

HORN ○
240

ELEMENT

DESCRIPTION

NAME

Control Name. The name of the ProtoThrottle control to be calibrated. Hold the control in the desired location and press the Up button to set the new calibration value.

HORN Threshold for the horn function activation
BRAKE Threshold for the brake function activation
BRAKE LOW Left brake handle stop
BRAKE HIGH Right brake handle stop; also threshold for emergency stop

○

Control Status. Shows the on/off status of the selected control.

○ OFF
■ ON

240

Internal ADC value for the selected control. Can normally be ignored, unless you're developing code for the ProtoThrottle or are just a nerd.

21

Cycle through Control Names



LCD Screen



Set new calibration value

Save threshold settings and return to Threshold Calibration Menu



None

Diagnostics Menu

DIAGS



Return to Main Menu

LCD Screen

None

Enter Diagnostics Sub-Menu

None

Diagnostics Sub-Menu

ELEMENT

DESCRIPTION

0 0% I N
- 0 -

Controls Display. Shows the current status of the ProtoThrottle controls and buttons. Pressing the up/down buttons will toggle through the current DCC function status.

SLEEP
300 sec

Sleep Timeout. Shows the number of seconds until the throttle goes to sleep.

ALERter
OFF

Alerter. Shows the number of seconds until the alerter expires.

ENGINE
HISTORY

Engine History. Use the up/down buttons to scroll through the engine state history stored in the throttle. The last eight engine on/off states are automatically stored, and recalled, when changing configurations or locomotive address.

PKT TIME
[■■■■■]

Packet Timeout. Timer reset by each packet received from the ProtoThrottle receiver. Communication is considered lost when the bar reaches zero.

RSSI
-43dBm

Received Signal Strength Indicator. Reports the strength of the wireless connection to the throttle.

FT RATIO
2.4:1

Fast Time Ratio. Reports the fast time ratio from the last update received.

Continued on next page

Diagnostics Sub-Menu

ELEMENT

DESCRIPTION

BATTERY
2.30V

Battery Voltage

VERSION
1.1.0

ProtoThrottle Firmware Version

GIT REV
000000

ProtoThrottle Firmware Short Git Hash

BASE TYP
CAB BUS

Base Type. The type of ProtoThrottle receiver to which the ProtoThrottle is connected.

BASE REV
000000

Base Unit Short Git Hash

FACTORY
RESET 5→

Factory Reset. Press the Down button 5 times to reset the ProtoThrottle to factory settings. **WARNING: This will erase all configuration settings, except those in the Threshold Calibration menu, so use with caution!**

Cycle through diagnostics settings



LCD Screen



None

Return to Diagnostics Menu



None



Notes:
1) All capacitors are ceramic (X7R/X5R) unless otherwise noted.
2) All capacitors and resistors are 0805 unless otherwise noted.

Open Design

Iowa Scaled Engineering is committed to creating open designs that users are free to build, modify, adapt, improve, and share with others.

Hardware

The design of the ProtoThrottle hardware is open source hardware, and is made available under the terms of the Creative Commons Attribution-Share Alike v3.0 license, a copy of which is available from: <http://creativecommons.org/licenses/by-sa/3.0/>

Design files can be found on the Iowa Scaled Engineering's Github site: <https://github.com/IowaScaledEngineering/mrbw-cst>

Firmware

The official Iowa Scaled Engineering firmware for the ProtoThrottle is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version. A copy of the GNU GPL can be found at: <http://www.gnu.org/licenses/gpl.html>

New firmware can be flashed into the ProtoThrottle through J2. The six pins are a standard AVR 6-pin ISCP programmer connection.

We encourage you to join the ProtoThrottle group forum: <https://groups.io/g/ProtoThrottle>
The forum will help with general and technical questions regarding the ProtoThrottle.

**Visit the Iowa Scaled Engineering website
to learn more about our full line of
model railroad electronics.**

www.iascaled.com
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Manual Version 1.2

www.protothrottle.com

ProtoThrottle**Model: MRBW-CST, HW Version: 1.2**

Iowa Scaled Engineering, LLC

support@iascaled.com

This product is not a toy. For ages 14 and over.

Contains FCC ID: MCQ-XBEE3

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modification to the device could void the user's authority to operate the equipment.

Contains Model XBEE3, IC: 1846A-XBEE3

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modification to the device could void the user's authority to operate the equipment. Des changements ou des modifications à l'appareil pourraient annuler l'autorité de l'utilisateur à utiliser l'équipement.

Notes

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