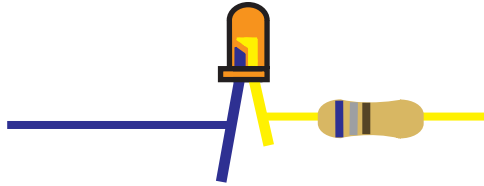
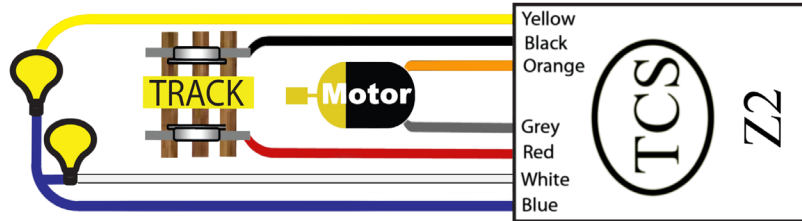


Wiring Diagram



Resistor values between 470 ohm and 1k ohm will work. 680 ohm is a typical value.

If you plan on using LED's one resistor must be in series with each LED. Being that LED's are diodes they must be wired in with their positive lead (long LED leg) connected to the positive (blue wire), and their negative lead (short LED lead, flat LED edge) to the negative function wire (yellow or white wire).

PROGRAMMING OTHER FEATURES: Decoder Lock, Variable Momentum, Button Control of the motor, Loadable Speed Tables, Modifiable Momentary Pulse, Mars, Gyra and Rotary Beacon Light and Function Remapping. If you wish to use them, see **Additional Programming Guide** at www.tcsdcc.com or get a copy at your Dealer.

WARRANTY PROCEDURE: All decoders are covered by a one year goof proof, no questions asked warranty. **Please return in a padded envelope or small box.**

1. Register the decoder(s) on our website at www.tcsdcc.com.
2. Print out a copy of the Warranty Registration and include it in the padded envelope with the decoder(s).
3. Return decoder(s) directly to TCS. Train Control Systems
PO Box 341
Blooming Glen, PA 18911

Compatible with NMRA DCC standards.

Made by **TCS** in the USA.

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P.O. Box 341
845 Blooming Glen Rd.
Blooming Glen, PA 18911

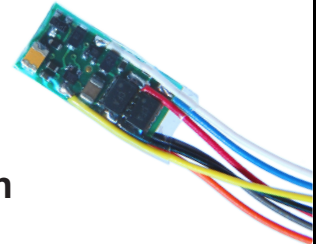


Phone **215-453-9145**
Fax **215-257-0735**
Email tcs@tcsdcc.com
Web www.tcsdcc.com

1296



Featuring
**Back EMF /
Load Compensation**



A powerful hard-wire decoder for **Z-Scale, N-Scale** and **Light Duty HO-Scale**. Particularly effective in AZL locomotives.
1 Amp continuous, 2 Amp peak motor drive with 2 x 60 mA lighting functions.

Z2

Dimensions: .51" x 0.26" x 0.11" or 12.95mm x 6.6mm x 2.79mm

True Z Scale decoder -- under 7mm in width.

Fits all Z-Scale Diesel Locomotives.

Super small size with powerful 1 Amp motor drive.

Includes all standard TCS decoder features including:
Auto-Adjusting BEMF / Load Compensation

- **Back EMF Load Compensation** for superior slow speed control even with heavy loads.
- **Quiet Drive** creates **SUPER QUIET** engine performance.
- **Autodetect** for realistic throttle response when using **DC power**.
- **Function Remapping**
- Standard 2 Digit or Extended 4 Digit Addressing.
- User Loadable Speed Tables for custom speed curves.
- 14 or 28 / 128 Speed Step Control operating at 256 speed steps.
- Additional lighting features not listed above include Random Flicker, Single & Double Strobe, and Constant Dim light.



Actual size



**Our Famous GOOF PROOF NO
Questions Asked Warranty**

WORKSHEET INSTRUCTIONS

- A blank outlined box is provided by each CV number. This is so you can preplan your decoder and have a record of your choices.
- In many cases you are recording a single value such as an address, a rate, or a limit.
- In some cases you are choosing more than one value such as actions, functions, or buttons. Each of these will have a value. Add the values of those you want active and enter that sum in the blank box.
- The other box by the CV number is the factory set value. If it is shaded, it can be reset with **Factory Reset**.

BASIC CONFIGURATION

Circle the values by all of the changes you want to make.

1	A	0	1	Reverse the direction the engine runs.
	B	2	-2	Use 14 Speed Steps instead of 28/128.
	C	4	-4	Disable analog (DC) operation.
	D	0	16	Make the Loadable Speed Tables active.
	E	0	32	Make the decoder address 128 or higher.
CV 29	6			Adjust the Default Value by the values you have circled.

ADDRESSING

2 Digit Address

Use if the address is 127 or less.

2	CV 1	3		Record your choice here.
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4 Digit Address

Make sure Table 1 "E" = 32.

3				Your command station will assign the values of CV 17 and CV18
CV 17	0			← Record your four digit address here
CV 18	0			

For more information about CV 17 and 18 visit our web entry on this topic at:
http://www.tcsdcc.com/faq/four_digit_addressing.htm

Consist Address

If this is greater than 0, the regular address is unalterable.

4				Add 128 to reverse the loco when in consist. Some systems only!
CV 19	0			Use a 2 digit address when in a consist (Multiple units).

Decoder Lock

Same address decoders need a different sub address in CV 16.

5	To unlock a decoder, make CV 15 = 0 or CV 15 = CV 16. To lock a decoder, make CV 15 not equal to CV 16. To lock all same address decoders, make CV 15 = 7.			
	CV 15	0	All unlocked = 0	Decoder to unlock = 1 - 6
	CV 16	1	Mobil = 1	Sound = 2
			Light Only = 3	___ = 4
			___ = 5	___ = 6

MOTOR CONTROL

Speed Graph

1 volt = 18

0 produces straight line acceleration.

6	CV 2	0	Start Volts	Set the voltage when the throttle is first applied.
	CV 6	0	Mid Volts	Set the voltage when the throttle is at midpoint.
	CV 5	0	Top Volts	Set the voltage when the throttle is at full speed.

Momentum

The effect of engines starting and stopping heavy loads.

7	CV 3	1	Acceleration	Larger values add time to each speed step.
	CV 4	1	Deceleration	Larger values add time to each speed step.
	CV 23	0	*Acceleration Adjustment when in Consist	
	CV 24	0	*Deceleration Adjustment when in Consist	

*Values above 128 increase the adjustment * Values below 128 decrease the adjustment

Dither

If BEMF is turned off dither can provide an alternate form of speed control.

10	CV 56	3	Dither Frequency	The highest frequency = 1.
	CV 57	10	Dither Voltage	The lowest voltage = 1.

NOTE: Both CV 56 and CV 57 must be greater than 0 for Dither to be active.

Back EMF, Rule 17 Dimming Options and Opposite Dim Control

Even number OR 0= BEMF OFF Odd number = BEMF ON

13	BEMF disabled = 0		BEMF enabled = 1		BEMF button control = 3		Dims when stopped = 16	
	To turn on BEMF and function button control of it, put 3 into CV 61						Opposite light is dimmed = 32	
	CV 61	1	BEMF and Dimming Control		BEMF+Stopped + Opposite dim = 49			
	CV 136	2	Function button control of BEMF		Bits 0-7 designates buttons 5-12			
	CV 64	15	Dimmed Brightness		(2 – 6 for LEDs, 12 – 18 for Bulbs)			
	CV 10	0	BEMF Cut Out		For more information go to www.tcsdcc.com/BEMF.pdf			

LIGHTING CONTROL

11 Light Function Wires

11	CV 49	0	White Wire	
	CV 50	16	Yellow Wire	

* Auto-Mars: Automatically turns Mars light on when decelerating below 36% speed. This setting also turns the Mars light on steady above 36% speed.

Rule 17 must be enabled in table 11 to enable dimming options in table 13.

Light Effect	fwd	rev	both
Constant Bright Light	0	16	32
Random Flicker (fire box)	1	17	33
Mars Light	2	18	34
Flashing Light	3	19	35
Single Pulse Strobe	4	20	36
Double Pulse Strobe	5	21	37
Rotary Beacon	6	22	38
Gyra Light	7	23	39
Rule 17 (dimmable light)	8	24	40
Ditch Light (Left or Right)	10	26	42
Ditch Light (Other side)	11	27	43
Constant Dim light (50%)	12	28	44
*Auto-Mars	13	29	45

Rule 17 Dimming Control

Rule 17 Dimming is turned on and off by button 4 as the default, but this value can be remapped via CV 123. See the Function Remapping guide on the literature section of www.tcsdcc.com for more info.

Analog (DC) Power Control Turn off Black or Red wire powered functions.

17	CV 13	255	Activate power to light functions on DC
	Brake on DC		Activate by subtracting 4 from CV 29 in table 1.

Consist Lighting Control

Activate so the direction of travel lights are lit.

18	CV 22	0	Headlight Functions	White and Yellow Wire = 0
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Factory Reset

Sets all CVs with a shaded value back to that value.

20	CV 8	153	Enter a value of 2 to perform a Factory Reset
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