

**TCS DCC decoders provide the ultimate in control.**



This decoder is in # \_\_\_\_\_



Side View

**M1**



Top View

**Two Function Micro Decoder**  
1.0 amp continuous, 2.0 amp peak motor drive  
**plus two 100 mA function outputs**

**Dither creates the ultimate in slow speed control.**  
**Quiet Drive creates smooth quiet engine performance.**  
**Factory Reset the fast way back to original settings.**  
**Goof Proof warranty no questions asked.**

**Small enough for N gauge: .350"wide by .565"long by .125"high.**  
**Powerful enough for HO gauge.**

**Reversing Headlights, Rule 17 dimming, Opposite Dim, Random Flicker, Mars Light, Gyra Light, Rotary Beacon, Single Pulse Strobe, Double Pulse Strobe and Flashing light.**

**Brake on DC** feature allows stopping and starting when a DC section is active, all with your programmed acceleration, deceleration and desired lighting.

**Autodetect senses DCC or DC** power for peak performance on either.

**Button Control** ( Function Remapping ) lets most buttons control the lights.

**All Program Modes are supported** allowing use with any controller.

**14 or 28 / 128 Speed Step Control** operating at 256 speed steps

**Basic and Advanced Consisting** for use with any controller.

**The Only Two Function Decoders with Lighting Effects.**

**User Loadable Speed Tables** for custom speed curves.

**OPS Mode Programming** allows on track programming

**Standard 2 Digit or Extended 4 Digit Addressing**

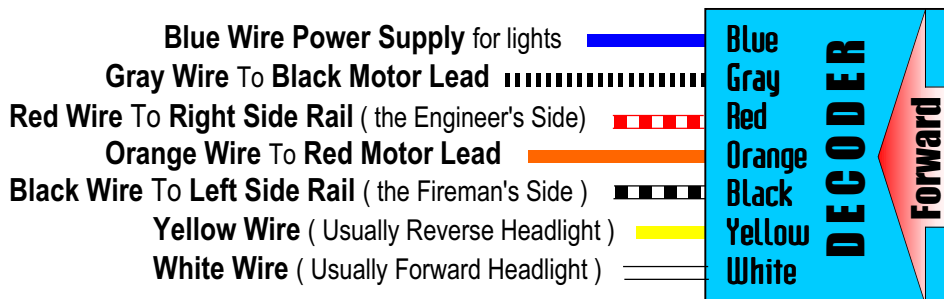
Compatible with NMRA DCC standards.

Made by **TCS** in the USA.

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# INSTALLATION INSTRUCTIONS



Make sure that you have both motor terminals isolated from every wheel! Failure to do this can cause the decoder to burn out. Place one probe of an Ohm meter on one of the motor terminals and touch every wheel ( both sides ) with the other probe. If you get no readings after repeating the process on both motor terminals, you are isolated. Be careful! A zero ( 0 ) or other Ohm reading indicates the motor terminals are not isolated.

When using bulbs rated less than the track voltage, you must use a resistor in series with the bulb.

Light Type and Power Source		Resistor Values in Ohms			
Quantity and Type of Light		Power Wire	12 V. Track	14 V. Track	16 V. Track
12V	( 1 ) 30ma Bulb	Blue	0 to 100	47 to 150	100 to 220
	( 2 ) 30ma Bulbs in Parallel	Blue	0 to 68	33 to 82	56 to 100
	( 3 ) 30ma Bulbs in Parallel	Blue	0 to 68	10 to 68	22 to 68
1.5V	( 1 ) 30ma Bulb	Blue	270 to 390	330 to 390	470 to 560
	( 2 ) 30ma Bulbs in Series	Blue	220 to 330	270 to 330	470 to 560
	( 4 ) 30ma Bulbs in Series	Blue	180 to 270	270 to 390	330 to 470

NOTE: If you are powering features with the red or black wires, make sure to make those features inactive on DC power because the voltage will be higher. See table 16. For resistor values for half power, see the insert for the T-2 decoder at your dealer or [www.tcsdcc.com](http://www.tcsdcc.com).

## BASIC CONFIGURATION

Make one choice from each row from "A" through "E" and total them on line 1.				Record
A	Normal Direction in Forward = 0	OR	Reverse Direction in Forward = 1	
B	14 Speed steps = 0	OR	28 / 128 Speed steps = 2	
C	Analog ( DC ) operation disabled = 0	OR	Analog ( DC ) operation enabled = 4	
D	Loadable Speed Table Inactive = 0	OR	Loadable Speed Table Active = 16	
E	2 Digit Addressing = 0	OR	4 Digit Addressing = 32	
1	Basic Configuration of the Decoder	total "A" thru "E"	CV 29	6

## ADDRESSING

Primary 2 Digit Address				Record
2	Primary Loco Address	use when "E" = 0	CV 1	3

Advanced 4 Digit Address				Record
3	First two digits of Extended Address	use when "E" = 32	CV 18	0
	Last two digits of Extended Address	use when "E" = 32	CV 17	0

Consist Address If this is greater than 0, you can't alter the regular address.				Record
4	2 Digit Address when added to a consist ( Multiple units ).		CV 19	0

NOTE: If you want to maintain some or all engine lighting when in consist, see table 17.

NOTE 2: Add 128 to reverse the engine direction when in consist. **Some systems only!**

## MOTOR CONTROL

<b>Start Volts</b> It is superceded by <b>Dither</b> . For most conditions, leave this "0".					Record
<b>5</b>	Start Volts	1 volt = roughly 18	use if "D" = 0	<b>CV 2</b>	<b>0</b>

<b>Speed Graph</b> Adjust these to make engines run alike.					Record
<b>6</b>	Top Volts	1 volt = roughly 18	use if "D" = 0	<b>CV 5</b>	<b>0</b>
	Mid Volts	1 volt = roughly 18	use if "D" = 0	<b>CV 6</b>	<b>0</b>

<b>Momentum</b> creates the effect of engines pulling and stopping heavy loads.					Record
<b>7</b>	Acceleration	Adds time to each speed step. Practical range is 0-25		<b>CV 3</b>	<b>0</b>
	Deceleration	Adds time to each speed step. Practical range is 0-25		<b>CV 4</b>	<b>0</b>

<b>8</b>	Loadable Speed Tables	Use if "D" = 16									
	CV 67	2		CV 74	30		CV 81	72		CV 88	135
	CV 68	5		CV 75	35		CV 82	79		CV 89	147
	CV 69	7		CV 76	40		CV 83	84		CV 90	161
	CV 70	12		CV 77	47		CV 84	93		CV 91	177
	CV 71	16		CV 78	51		CV 85	100		CV 92	196
	CV 72	21		CV 79	58		CV 86	112		CV 93	219
	CV 73	26		CV 80	65		CV 87	121		CV 94	255

NOTE: Shaded CVs are the ones used for 14 speed steps ( when "B" = 0 ).

<b>Kick Start</b> It is superceded by <b>Dither</b> . A value of "0" in CV 65 nullifies Kick Start.					Record
<b>9</b>	Burst Duration	Higher values increase duration. 60 = 1 sec.		<b>CV 58</b>	<b>50</b>
	Burst Voltage	Higher values increase voltage. 18 = roughly 1 volt		<b>CV 65</b>	<b>0</b>

**Dither provides the ultimate in slow speed control.** Engines will run slower than one half MPH.

NOTE: Both CV 56 and CV 57 must be greater than 0.

<b>Dither</b> provides the ultimate in slow speed control. Engines will run slower than one half MPH.					Record
<b>10</b>	Dither Frequency	The frequency range is 1 ( high ) to 10 ( low )		<b>CV 56</b>	<b>6</b>
	Dither Voltage	The practical range is 5 ( low ) to 50 ( high )		<b>CV 57</b>	<b>15</b>

NOTE: If the flywheel isn't moving with the throttle at 1% or 2%, increase CV 57 by 5 until you have some very slow movement of the flywheel. If you want to change the motor speed, increase or decrease CV 56 by 1 until it is running as desired.

## LIGHTING CONTROL

Lighting	Timing	+	Effect	=	Total
<b>11</b> White Wire	CV 49		0		
Yellow Wire	CV 50		16		

**Choose when you want the light On ( timing ).**

Light is On when running Forward only = 0

Light is On when running in Reverse only = 16

Light is On when running in Both directions = 32

### Choice of lighting effects.

Constant Bright Light = 0

Random Flicker ( fire box ) = 1

Mars Light = 2

Flashing Light = 3

Single Pulse Strobe = 4

Double Pulse Strobe = 5

Rotary Beacon = 6

Gyra Light = 7

Rule 17 ( dimmable light ) = 8

Constant Dim light ( 50% power ) = 12

NOTE: Add the value you choose for the light timing to the value you choose for the lighting effect to get the value you need for the CV you are programming.

<b>CHOICES:</b>	Dims when loco is stopped = 16	Opposite headlight is on dimmed = 32	Record Your Total	
<b>12</b>	<b>Headlight Dimming Parameters</b>		<b>CV 61</b>	<b>0</b>

**NOTE:** This is not used unless you have an 8 in the effect column of table 11.

**Gyra or Mars Light Modification.** You can use only the Gyra light or Mars light at a particular time. CV 59 controls total cycle time. Lower values equal a shorter cycle. CV 60 controls time at low power. Lower values equal less time at low power. The default values are for a Gyra light. Set up for a Mars light by trying CV 59 = 46 & CV 60 = 12.

				<b>Gyra Light</b>	<b>Mars Light</b>
				Record	Record
<b>14</b>	<b>Oscillating Light Modulation</b>	<b>CV 59</b>	46		
	<b>Oscillating Light Latency</b>	<b>CV 60</b>	54		

**NOTE:** This is not used unless you have a 2 or 7 in the effect column of table 11.

**Button Control (Function Remapping)** Circle the value under the button number you want to control each wire. One button can control multiple wires. One wire can be operated by multiple buttons.

<b>15</b>	<b>Button Number</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>R - 0 - F</b>	Total for each Row	
	White Wire	128	64	32	16	8	4	2	1	<b>CV 33</b> 1
	Yellow Wire	128	64	32	16	8	4	2	1	<b>CV 34</b> 2
				4	<b>Rule 17 dims when button 4 is pressed</b>					

**NOTE:** If you are using light dimming, do not use button 4 for any wire because it controls light dimming. You may use button 4 as you wish if there is no conflict with dimming.

<b>CHOICES:</b>	White Wire = 1	Yellow Wire = 2	Record Your Total	
<b>16</b>	<b>Wires you want to use with Analog (DC) Power</b>		<b>CV 13</b>	<b>255</b>

**NOTE:** If you are powering one or more of these wires with the red or black wires (AC), do not have that wire active with DC power because the voltage will be higher.

<b>CHOICES:</b>	White Wire = 1	Yellow Wire = 2	Record Your Total	
<b>17</b>	<b>Headlight wires you want active when engine is in a Consist</b>		<b>CV 22</b>	<b>0</b>

**NOTE:** You can program a pair of engines so that when in consist, only some lights of the front engine light and only some lights of the rear engine light.

## CONVENIENCE

**Factory Reset** allows you to reset all of the CVs with a shaded default value back to their factory set value. To start the process, enter a value of 2 in either CV 30 or CV 8. Then turn off the power and then restart. The reset is now complete.

<b>18</b>	<b>Factory Reset</b>	<b>CV 30</b>	<b>0</b>	Record Your Choice
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## WARRANTY

This decoder is covered by a one year goof proof, no questions asked replacement warranty. Send decoders directly to TCS. Please include your phone number, Email address, and street address when returning any items.

## WARNING

The interior of this product contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.