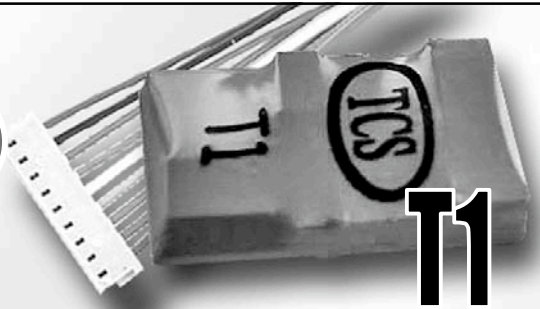


**TRAIN CONTROL
SYSTEMS**



**A powerful decoder for HO scale with a 9 pin harness
and two 100mA function outputs.**

1.3 amp continuous, 2.0 amp peak motor drive

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

Autodetect senses DCC or DC power and operates at peak performance on either.

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

Button Remapping lets most buttons control the lights.

**Reversing Headlights, Rule 17 and Opposite Dim, Adjustable Brightness
when Dimming, and Random Flicker (fire box) lighting.**

Full Range Dither extends Dither throughout the entire speed range.

Decoder Lock allows changing any decoder with the same address.

All Program Modes are supported allowing use with any controller.

**Button Control of the motor circuit allows use of the motor circuit
for a smoke unit or additional lighting function up to 1.2 amps**

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 Decoder with Lighting Effects

User Loadable Speed Tables for custom speed curves.

OPS Mode Programming allows main track programming

Standard 2 Digit or Extended 4 Digit Addressing

9 pin Wiring Harness








Compatible with NMRA DCC standards.

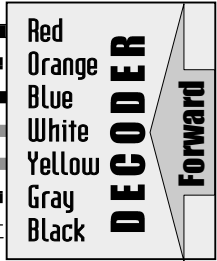
Made by **TCS** in the USA.

Contact TCS at: P.O. Box 341, 845 Blooming Glen Rd., Blooming Glen, PA 18911
Phone **215-453-9145** Fax **215-257-0735** Email **tcs@ot.com** Web **www.tcsdcc.com**

© Copyright Train Control Systems 2003 - 2005

INSTALLATION

- Red Wire To Right Side Rail (the Engineer's Side) 
- Orange Wire To Red Motor Lead 
- Blue Wire Power Supply for lights 
- White Wire (Usually Forward Headlight) 
- Yellow Wire (Usually Reverse Headlight) 
- Gray Wire To Black Motor Lead 
- Black Wire To Left Side Rail (the Fireman's Side) 



NOTE: The Harness Green and Purple wires (Outside Wires) are not used with this decoder.

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
12 V	(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
1.5 Volt	(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
LED	(1) 30ma Bulb	Red <u>or</u> Black	180 to 270	220 to 330	270 to 390
	(2) 30ma Bulbs in Series	Red <u>or</u> Black	100 to 180	150 to 220	220 to 330
	(4) 30ma Bulbs in Series	Red <u>or</u> Black	10 to 100	47 to 150	82 to 180
LED	(1) White LED	Red <u>or</u> Black	180 to 1200	220 to 1500	270 to 1800
	(2) White LEDs in Series	Red <u>or</u> Black	82 to 680	150 to 820	180 to 1200
	(1) Color LED	Red <u>or</u> Black	220 to 1200	270 to 1800	330 to 2200
	(2) Color LEDs in Series	Red <u>or</u> Black	150 to 1000	220 to 1500	270 to 1800

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	Engine address is 127 or less = 0	OR	Engine address is 128 or more = 32	
1	Basic Configuration of the Decoder		total "A" thru "E"	CV 29 6

ADDRESSING

2 Digit Address Use if the address is 127 or less. Record

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

4 Digit Address Use the systems procedure if available. Example Your Choice

3	Enter the desired engine number on your calculator.	2147	
	Divide by 256 and enter the whole number in CV 17.	8,3867	
	Multiply the whole number by 256 then subtract it from the engine number and enter the result in CV 18.	2147 - 2048 = 99	
		CV 17 0	CV 18 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
	If you want to maintain some or all engine lighting when in consist, see table 17.	
	Add 128 to reverse the engine when in consist. Some systems only!	

Decoder Lock When CV 15 = 0 all decoders with the same address are unlocked - - when CV 15 equals CV 16 all decoders are locked except the decoder in CV 16 - - when CV 15 = 7 all are locked.

If you have two of any type decoder, give the second one a sub address of 4, 5, or 6 in CV 16. Record

G	All Unlocked = 0	Decoder below you want to unlock = ?	All locked = 7	CV 15	0			
	Mobil = 1	Sound = 2	Light Only = 3	_____ = 4	_____ = 5	_____ = 6	CV 16	1

MOTOR CONTROL

Start Volts It is superceded by Dither. For most conditions, leave this "0". Record

5	Start Volts	1 volt = roughly 18	use if "D" = 0	CV 2	0	
----------	--------------------	---------------------	----------------	------	---	--

Speed Graph Using "0" (the default value) produces straight-line acceleration. Record

6	Top Volts	1 volt = roughly 18	use if "D" = 0	CV 5	0	
	Mid Volts	1 volt = roughly 18	use if "D" = 0	CV 6	0	
Adjust these to make engines run alike. This is useful in multiple unit operation.						

Momentum creates the effect of engines pulling and stopping heavy loads. Record

7	Acceleration	Adds time to each speed step. Practical range is 0-255	CV 3	0	
	Deceleration	Adds time to each speed step. Practical range is 0-255	CV 4	0	

Loadable Speed Tables

Use if "D" = 16

8	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	
Shaded CVs are the ones used for 14 speed steps (when "B" = 0).									

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.

Record

10	Dither Frequency	The frequency range is 1 (high) to 10 (low)	CV 56	3	
	Dither Voltage	The practical range is 5 (low) to 50 (high)	CV 57	10	
	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. Then if you want to fine tune the motor speed, increase or decrease CV 56 by 1 until it is running as desired.				

LIGHTING CONTROL

Lighting Effects Add the value you choose for the timing to the value you choose for the effect to get the value you need for the CV you are programming.

				Choice of lighting effects.			
				Constant Bright Light = 0			
				Random Flicker (fire box) = 1			
				Rule 17 (dimmable light) = 8			
				For future use = 9			
11	Lighting CVs		Timing + Effect = Total				
	White Wire	CV 49	0	+		=	
	Yellow Wire	CV 50	16	+		=	
	Choose when light is 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							

Button Control of the Motor, Headlight Dimming and Full Range Dither

Button Control of the Motor Circuit (F) allows you to use the higher amp motor circuit (1.2 A) for a smoke unit or an additional lighting circuit. Choose manual (button 2 for forward, and 3 for reverse) or automatic control (button 2 for on/off, and reverse is automatic).

Control of Motor Circuit (F) Allows the motor circuit to be used for other purposes.				Record Your Total		
F	Not Used = 0	Manual Control = 64	Automatic Reverse = 68	0		
I	Not Used = 0	Headlight Dims when stopped = 16	Opposite Headlight is dimmed = 32	0		
12	Control Configuration			Add "F" & "I"	CV 61	0
	Headlight Dimming (I) is not used unless you have an 8 in the effect column of table 11.					

Brightness Adjustment when using Opposite Dim or Rule 17

Record Your Total

K	Useable Values are 1 to 30. (1 = maximum dim, 30 = no dim)			CV 64	16	
	NOTE: A value of 16 = 50% for Incandescent bulbs. Values of 2 – 6 work great for LEDs.					

Button Remapping

Circle the value under the button numbers you want to control the wire.

15	Button Number	6	5	4	3	2	1	Rev	0	Fwd	Total for the Row		
	White Wire	128	64	32	16	8	4	2	1			CV 33	1
Yellow Wire	128	64	32	16	8	4	2	1			CV 34	2	
			4	Rule 17 dims when button 4 is pressed									
No changes are required here to operate button control of the motor circuit.													

Wires you want to use with Analog (DC) Power

Record Your Total

16	White Wire = 1	Yellow Wire = 2	CV 13	255	
	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.				

Headlight wires you want active when engine is in a Consist (MU)

Record Your Total

17	White Wire = 1	Yellow Wire = 2	CV 22	0	
	NOTE: You can program a pair of engines so that when in consist, only the headlight of the front engine lights and only the reverse headlight of the rear engine lights.				

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.

Record Your Choice

18	Factory Reset	CV 30	0	
-----------	----------------------	--------------	----------	--

Identification Numbers

Record Your Choice

19	TCS Decoder Version Identification	CV 7		
	TCS Manufacturer Identification Number	CV 8	153	
	User Identification Provided for User	CV 105	0	
	User Identification Provided for User	CV 106	0	

WARRANTY This decoder is covered by a one year goof proof, no questions asked replacement warranty. Send decoders in a padded envelope or small box directly to TCS. (If mailing, use the P.O. Box address, otherwise use the street address.) 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.