



**Train Control Systems Inc.**  
Manufacturing the highest quality DCC decoders since 1999

## Main Features of this Decoder:

**Industry-Leading BEMF Motor Control:** Provides superior slow speed control under all load conditions.

**On-Board Keep Alive®:** Helps overcome spotty electrical pick up issues to keep your loco running smoothly.

**LED-Ready Lighting:** This decoder has on-board resistors for use with LED's. It is not necessary to add your own external current-limiting resistors.

**RailCom®:** This decoder supports RailCom bi-directional communication.

**DC Mode:** Decoder will automatically detect DC power. You can also configure how your lighting effects function on DC.

**Variable Momentum:** Allows you to make custom acceleration and deceleration curves.

**Function Remapping:** Buttons 0 through 12 may be used to control the lighting functions of this decoder.

**Programmable Lighting Effects:** Choose from 20 separate user-programmable lighting effects including beacons and flashing ditch lights!

**Other Features of This Decoder:** This decoder has more features than could be listed in this pamphlet. For the complete list of available features, visit our website [tcsdcc.com](http://tcsdcc.com) to download the "Comprehensive Programming Guide" found in the [Documentation](#) section of our website.

**WARRANTY PROCEDURE:** This decoder is covered by a one-year manufacturer's warranty which covers manufacturing defects.

- For registration, more details, and disclaimers, please visit [tcsdcc.com/warranty](http://tcsdcc.com/warranty)
- Print out a copy of the email confirmation and include it in the box
- Return warranties directly to TCS using the P.O. Box listed below **in a small box**

Compatible with NMRA DCC standards

Designed & Built by TCS in the USA

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|      |        |       |           |                             |                 |
|------|--------|-------|-----------|-----------------------------|-----------------|
| 1561 | AZL2D5 | Scale | Functions | Function Rating             | Continuous/Peak |
|      |        | Z     | 5         | 12mA (each)<br>30mA (total) | 1.5/3.0 Amp     |

Dimensions: 1.96" x 0.24" x 0.21" or 50.0mm x 6.0mm x 5.4mm

The AZL2D5 drop-in decoder is designed for American Z Line SD40 diesel locomotives. The decoder features a screw-down design, unlike previous designs which relied on slide-on contacts.

The AZL2D5 can support up to five lighting functions, including three on-board LED's. Solder pads for two additional lighting functions are also available. The AZL2D5 uses a 5V power supply and on-board resistors for all LED functions.

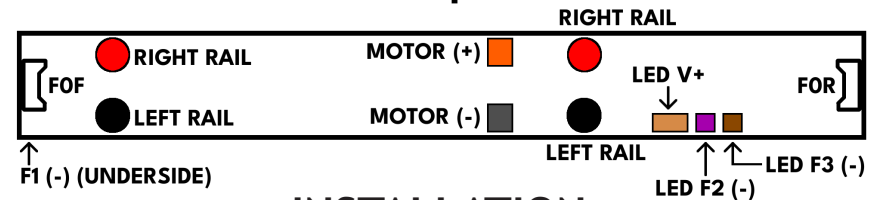
**KA-N1 Keep Alive® is included on-board this decoder**

The AZL2D5 also supports bi-directional communications with RailCom®

## WIRING DIAGRAM

This decoder is a direct drop-in and does not require soldering or wires. Refer to the wiring diagram below to connect the Auxiliary functions.

<<< FRONT | REAR >>>



## INSTALLATION

For detailed installation examples visit our website where we maintain a constantly growing database of a wide range of locomotives and decoders.



## BASIC CONFIGURATION

| CV 29 Configuration  |     |                         |   |
|--|-----|-------------------------|---|
| A  | 0   | 1                       | Reverse the direction the engine runs.                        |
| B  | 2   | 2                       | Use 28/128 speed step mode.                                   |
| C  | 4   | 4                       | Enable analog ( DC ) operation.                               |
| D  | 8   | 8                       | Enable RailCom® Bi-Directional Communication (If Supported)   |
| E  | 0   | 16                      | Make the Loadable Speed Tables active.                        |
| F  | 0   | 32                      | Make the decoder address 128 or higher.                       |
| CV 29  | 14  |                         | ← Program the sum of the values you choose into CV 29         |
| 2 Digit Address Use if the address is 127 or less.   |     |                         |   |
| CV 1   | 3   |                         | ← Record your choice here.                                    |
| 4 Digit Address Make sure 4-digit Addressing is enabled in CV29  |     |                         |   |
| CV 17  | 0   |                         | ← Record your four digit address here                         |
| CV 18  | 0   |                         | Your command station will assign the values of CV 17 and CV18 |
| Consist Address Add 128 to reverse the loco when in consist.   |     |                         |   |
| CV 19  | 0   |                         | Use a 2 digit address when in a consist ( Multiple units ).   |
| Decoder Lock   |     |                         |   |
| CV 15  | 0   |                         | All unlocked = 0 Decoder to unlock = 1 - 6 All locked = 7     |
| CV 16  | 1   |                         | Mobile = 1 Sound = 2 Light Only = 3 4 5 6                     |
| 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. |     |                         |   |
| Factory Reset  |     |                         |   |
| CV 8   | 153 |                         | Program a value of 2 or 8 to perform a Factory Reset.         |
| Back EMF and Rule 17 Dimming Options   |     |                         |   |
| Even number OR 0= BEMF OFF Odd number = BEMF ON  |     |                         |   |
| BEMF disabled =0   |     | BEMF enabled = 1        |   |
| Turn on BEMF and button control of it make CV 61 = 3   |     | BEMF button control= 3  |   |
|  |     | Dims when stopped = 16  |   |
|  |     | Opposite light dim = 32 |   |
| CV 61  | 1   |                         | BEMF and Dimming Control                                      |
| CV 136   | 2   |                         | BEMF+Stopped + Opposite dim = 49                              |
| CV 64  | 15  |                         | Function button control of BEMF                               |
| CV 10  | 0   |                         | Bits 0-7 designates buttons 5-12                              |
|  |     |                         | Dimmed Brightness ( 2 - 6 for LEDs, 12 - 18 for Bulbs )       |
|  |     |                         | BEMF Cut Out  |
| RailCom®   |     |                         |   |
| CV 28  | 7   |                         | RailCom® Options  |
| RailCom® is a registered trademark of Lenz Elektronik GmbH   |     |                         |   |
| For more information on decoder features or programming visit:<br><a href="https://tcsdcc.com">tcsdcc.com</a>  |     |                         |   |

## MOTOR CONTROL

| Speed Graph  |   |  |  |
|--|---|--|--|
| 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   |   |  |  |
| 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 |   |  |  |
| Motor Trim   |   |  |  |
| CV 66  | 0 |  | Forward Trim   |
| CV 95  | 0 |  | Reverse Trim   |
| Values above 128 increase speed, values below 128 decrease speed.                    |   |  |  |

## LIGHTING CONTROL

| Lighting Features  |    |                               |  |                       |      |
|--|----|-------------------------------|--|-----------------------|------|
| Light Function Wires   |    | Light Effect                  | fwd  | rev                   | both |
| CV 49  | 0  | White Wire                    | FOF  |                       |      |
| CV 50  | 16 | Yellow Wire                   | FOR  |                       |      |
| CV 51  | 32 | Green Wire                    | F1   |                       |      |
| CV 52  | 32 | Violet Wire                   | F2   |                       |      |
| CV 53  | 32 | Brown Wire                    | F3   |                       |      |
|  |    | Constant Bright Light         | 0  | 16                    | 32   |
|  |    | Random Flicker ( fire box ) 1 | 1  | 17                    | 33   |
|  |    | Mars Light                    | 2  | 18                    | 34   |
|  |    | Flashing Light                | 3  | 19                    | 35   |
|  |    | Single Pulse Strobe 1         | 4  | 20                    | 36   |
|  |    | Double Pulse Strobe 1         | 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 1                | 12   | 28                    | 44   |
|  |    | *Auto-Mars                    | 13   | 29                    | 45   |
|  |    | Brake Light(s)                | 14   | 30                    | 46   |
|  |    | Single Pulse Strobe 2         | 15   | 31                    | 47   |
|  |    | Double Pulse Strobe 2         | 64   | 80                    | 96   |
|  |    | Random Flicker 2              | 65   | 81                    | 97   |
|  |    | Constant Dim 2                | 66   | 82                    | 98   |
|  |    | Constant Dim 3                | 67   | 83                    | 99   |
|  |    | Constant Dim 4                | 68   | 84                    | 100  |
| 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 in the lighting section of <a href="https://docs.tcsdcc.com">docs.tcsdcc.com</a> for more info. |    |                               |  |                       |      |
| Consist Lighting Control   |    |                               |  |                       |      |
| CV 21  | 0  |                               | Extra Functions  | F1=1 F2=2 F3=4 All=7  |      |
| CV 22  | 0  |                               | Headlight Functions  | Front=1 Rear=2 Both=3 |      |
| Lighting Quick Presets   |    |                               |  |                       |      |
| CV 8   | 10 |                               | Program a value of 10 to make violet and green ditch lights. Button 1 turns them on and Button two makes them blink. |                       |      |
|  | 11 |                               | Program a value of 11 for default trolley settings.  |                       |      |
|  | 12 |                               | Program a value of 12 for standard trolley settings and tail lights.   |                       |      |
| Note: For more information on Quick Presets visit <a href="https://docs.tcsdcc.com/wiki/CV_8_Macros">https://docs.tcsdcc.com/wiki/CV_8_Macros</a>  |    |                               |  |                       |      |