QSI Solutions

Titan E.T.™

Programming Guide for the Quantum Titan ET™
Diesel Sound and Power Decoder with Emulator Technology™

Sound Set Id#:

☐☐☐☐ – ☐☐☐

☐ ALCo	☐ Baldwin	☐ EMD	☐ FM	☐ GE	☐ Winton	☐ Other
Notes or Specific Prime Mover:						

EXPERIENCE THE

STEREO

DIFFERENCE

Table of Contents

In addition to this Programming Guide you should have also received one of the following:

- **Quantum Titan Large Scale Hardware Installation Guide**
- **Quantum Titan U Hardware Installation Guide**
- **Quantum Titan A Hardware Installation Guide**

If you did not receive one of these additional manuals please contact your dealer or visit www.QSISolutions.com

Introduction

Congratulations! You now own the most powerful, dynamic and flexible piece of model railroading technology in the (current) known universe! Your Quantum Titan ET™ decoder with Emulator Technology™ brings previously unobtainable sound and operating realism to your model railroading experience. Note that while we try to configure the decoder to be as realistic as possible for you right "out of the box," you may want to tweak some of its settings to fully reflect your personal preferences. This guide is designed to help you do just that, and walk you through its most commonly programmed elements. Just please be aware that your new Titan ET™ is capable of *far* more operating and sound capabilities than can be covered in a document of this size — so please promise us right now that you'll explore them *all* by downloading the full *Quantum DCC Reference Manual* from our website at www.QSI Solutions.com.

Our Philosophy

At QSI Solutions we take user input and requests very seriously, and work hard to incorporate them on an ongoing basis. This is one of the primary reasons we believe in an *upgradeable* product. This enables users who have already purchased and installed a Titan ET™ to acquire new features as they are developed, simply by downloading an updated sound file from our website and reloading it into their existing decoder via our Quantum Programmer device (sold separately). In an age where the same "flash memory" device resides in virtually every electronic device we own, we feel it is exploitive to require our customers to buy a *new* decoder in order to gain access to the newest feature or sound we've developed. We have an ongoing commitment to provide Titan ET™ owners continuing access to the most creative, imaginative and prototypically accurate sound and operating technology in the industry. You'll be amazed at what we have in the pipeline. So let's get started!

Before We Begin

This guide is specifically aimed at DCC users — as the Titan ET™ is a DCC decoder. It is *functional* on DC analog layouts, but its programming options are more limited because the ability to carry digital information is greatly reduced on a DC system. For information on DC programming, please see the Quantum Titan DC Programming Addendum on our website. We encourage DC operators who seek full programming capability to purchase a Quantum Programmer.

Important: Because Titan ET™ decoders offer many more features than other decoders, additional programming is sometimes required to activate and fine tune the specific characteristics you're seeking. We assure you this will be time well spent! We hope is this manual covers most of the questions you'll have — but as mentioned, we recommend you at least familiarize yourself with the full *Quantum DCC Reference Manual* on our website at www.QSI Solutions.com.

The *Manual* provides complete information on all of the various features and settings available in the Titan ET™. If you have additional questions or do not understand something in any of our materials, *please do not hesitate to contact us for assistance*. We pride ourselves on our customer service — and whether you've purchased 1 or 100 decoders, we want to help you experience the unparalleled performance we've worked so hard to bring to your model railroad via the Titan ET™. That said, we have just one last "request:" PLEASE read this guide in its entirety!

IMPORTANT NOTE: RESETTING THE DECODER

Should you get into trouble at any point during your programming or operating, you can reset your decoder to factory default specifications. QSI decoders have a *manual reset* which can be effected by shorting two contact points together, and then applying power* — but you can also use basic DCC CV programming to reset factory defaults. To do so, enter the values shown for these CVs in the following order:

CV50=255
CV49=128
CV56=113

After entering the 3rd CV (CV56) we recommend you "cycle the power" to the locomotive by turning the power off, and then back on again. Of course, you can also accomplish this by simply rocking the engine off the track to one side, and putting it back down again. The locomotive should then respond to address 3 again (the default), and you should hear the word "reset" spoken by the decoder.

***For information on how to manually reset your decoder using these contact points, please see the hardware installation guide provided with your decoder at the time of purchase.**

Using and understanding "Indexed CVs"

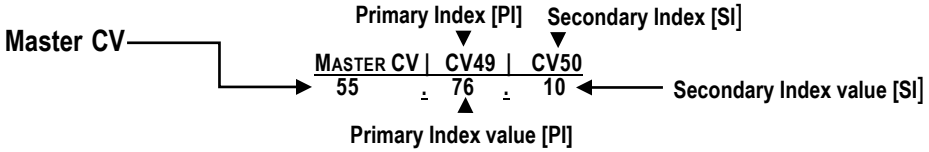
The Titan's continuously growing list of features presented us with a challenge: how to keep related CVs grouped together neatly and logically. "Indexed CVs" are the answer, because they enable us to accommodate new features without being forced to assign the CVs that control them to the next "available" CV number.

Let's use our Mars light as an example; over the years, we have added new features to the Mars light over 15 times! If we were assigning CV numbers to these features conventionally in a linear manner, we'd have some Mars light controls in the CV30 range, others in the CV60 range, and still others up around CV210. This would make trying to configure your Mars light an absolute nightmare.

CV indexing enables us to organize and store related programming functionality under one "Master" CV. The confusing part to many modelers is the fact that access to a Master CV's programmability can *only be gained through its indexes*. A Master CV can have as many as two such indexes. Referred to as "Primary" and "Secondary" indexes, they are expressed as decimal places in an indexed CV's formula. Happily, the CV numbers of the Primary and Secondary indexes *remain the same, regardless of which Master CV we want to program*. Noting the following "rules" should help:

Rule 1: The Master CV contains all broadly-related functions. Master CV 55, for example, contains all lighting information and functionality.
Rule 2: In any indexed CV, *only* the Master CV can be programmed to control a given function.
Rule 3: The same two Primary and Secondary indexes – CV 49 and CV 50 respectively – are always used to provide access to a Master CV, *regardless of which Master CV is to be programmed*.
Rule 4: The values programmed into the Primary and Secondary indexes *determine* what function will be programmable in the Master CV.

Understanding the numbers.
Let's again use our Mars light to illustrate. A forward facing Mars light's indexed CV formula is expressed as: CV55.76.10. Illustrated in table form, here's what those numbers tell us:



Another (understandable) point of confusion for many modelers is the fact that in order to program Master CV55, you have to *first* enter the decimal values shown in its formula into its Primary and Secondary indexes – CV 49 and CV50 – and do so in reverse order, *from right to left*, when the formula is read right to left. In the above example then, we'll first go to CV50 (the Secondary Index) and enter a value of "10," followed by entering "76" into CV49 (the Primary Index). Once we've done that, we can go to CV55, our Master CV, and program its values to whatever level we prefer – which in this case is between 0-255 (its default value is 32).

Many people find it helpful to write out a small table to help keep the values straight. If we converted our example to read "normally" in the order in which its values must be entered, it would look like this:

CV50	CV49	CV55
10	76	0-255

And there are two more "rules":
Rule 5: Not all indexed CVs require entry of a Secondary Index value. If a formula shows only one decimal place, as does the 51.0 formula of the Master System Volume, for example, the Secondary Index value is disregarded. In this example, we'd go directly to CV 49, our Primary Index, and enter "0." We'd then go to CV51 — and have access to its 0-127 volume control programmability.
Rule 6: The best news: you only have to enter values into the Primary and Secondary Indexes *the first time you program* a Master CV. QSI decoders store the primary and secondary values once they've been entered — meaning you can make subsequent adjustments to a Master CV simply by going directly back to it. No need to re-enter CVs 50 and 49.

Basic Operational CVs

CV#	CV NAME	DEFAULT	RANGE
1	Primary Address	3	1-127
17	Extended Address Low Byte	192	*
18	Extended Address High Byte	0	*
29	Configuration Data #1	6	0-55
2	V-Start (start voltage)	17	0-255
5	V-High (top speed)	1	0-255
6	V-Mid (mid speed)	0	0-255
3	Acceleration Rate (momentum)	0	0-255
4	Deceleration Rate (momentum)	0	0-255
62	Verbal Programming Read-Back	1 (ON)	0-1 0(Off)

***Special Range: See CV17/18 Extended Address**

CV 1: Primary/Short Address. If you intend to use a short address (between 1 and 127), simply enter the address as the value of CV1.

CV 17/18: Extended (Long) Address. Four digit addresses require programming of CVs 17 and 18 — which are known as a high-byte/low-byte, or "paired" CV — meaning that the two CVs *together* hold *one* piece of information. Many DCC systems automatically compute these values together for you — just follow their directions for 4-digit addressing†. If yours does not, you can compute and "build" the address you want by assigning a different value to each CV, using the following equation. (Get out your calculator, have courage and take it step-by-step; it's not as bad as it appears!)

A. Start with the locomotive address; divide it by 256 **Sample 4449 ÷ 256 = 17.379**
B. Take the whole number (17) and add 192. **Sample 17 + 192 = 209**
C. Program the value (209) in step B into CV17.
D. Multiply the whole number (17) from step A by 256. **Sample 17 X 256 = 4352**
E. Subtract the loco address from the computed value in step D. **Sample 4449 – 4352= 97**
F. Program the value (97) in step E into CV18. (Some systems may require a 0 to be placed in front of numbers less than 100. That would make the 97 a 097.)
G. Finally, you'll need to activate 4 digit addressing; program CV-29 to one of the 4 digit address values shown in the table below.

† IMPORTANT: If your DCC System fails to correctly set the long address using its proprietary "auto address program" function, disable "verbal read-back" by setting CV62=0 and try the process again.

CV 29: Configuration Data 1: CV29 controls 4 things at one time. First, it controls which speed table is accessible in the decoder (i.e., 14, or 28/128 speed steps). Second, it determines whether or not your locomotive will still run on a DC power pack (analog mode conv.). Third, it tells the locomotive which direction is its "normal" travel direction. Lastly, it determines whether your loco will accept a 2 or 4 digit address. For the specific value to enter use the reference chart below. For simplification this table is abridged to include only the most commonly used values. A complete table is found in the full DCC reference guide at www.QSISolutions.com

Value for CV29	Speed Table	Analog	Normal Direction	2/4 Digit Addr.
2/18	28/128	Off	Forward	2
3/19	28/128	Off	Reverse	2
6/22	28/128	On	Forward	2
7/23	28/128	On	Reverse	2
34/50	28/128	Off	Forward	4
35/51	28/128	Off	Reverse	4
38/54	28/128	On	Forward	4
39/55	28/128	On	Reverse	4

Sound Adjustments

Your Titan offers you an incredible number of adjustable sound control CVs. Sound control CVs are broken into two groups: Volume, and Stereo Balance, both of which are broken into two sub groups: Individual Sound Control and Component Sound Control. "Individual" sounds include all "general" locomotive sounds. "Component" sounds capture the specific component sounds that occur within a given Prime Mover. Note that there are dedicated Component Sound controls for *both* Prime Movers in dual Prime Mover locos.

You've read the section on Using and Understanding Indexed CVs. To simplify the process we use color coded charts like the one below, and throughout the rest of this guide, to illustrate the programming sequence. We enter these values by reading them *in reverse order* – from right to left. Enter the RED VALUE FIRST (if a value is shown) into CV50 (the Secondary Index), then the GREEN VALUE SECOND into CV49 (the Primary Index), and the variable BLUE VALUE LAST into the Master CV. It is this last range of programmable values that controls the functionality of the Master CV.

Individual Sound Volumes

Note: Each programmed increment is a volume change of 2db to the respective sound you're programming.

Master Volume	CV	CV51	CV49	CV50	CV51 Value Effect
Master System Vol.	51.0	0-127	0	--	0=Minimum Volume. 127 = Maximum Volume
Individual Sound Vol. CVs	**CV**	**CV52**	**CV49**	**CV50**	**CV 52 Value Effect**
Horn	52.0	0-15	0	--	0= Minimum Volume. 15= Maximum Volume
Bell	52.8	0-15	8	--	0= Minimum Volume, 15= Maximum Volume
Prime Mover Master 1*	52.10	0-15	10	--	0= Minimum Volume, 15= Maximum Volume
Prime Mover Master 2*	52.11	0-15	11	--	0= Minimum Volume, 15= Maximum Volume
Air Pump	52.16	0-15	16	--	0= Minimum Volume, 15= Maximum Volume
Cooling Fans	52.19	0-15	19	--	0= Minimum Volume, 15= Maximum Volume
Long Air Let-off	52.21	0-15	21	--	0= Minimum Volume, 15= Maximum Volume
Short Air Let-off	52.22	0-15	22	--	0= Minimum Volume, 15= Maximum Volume
Squealing Brakes	52.24	0-15	24	--	0= Minimum Volume, 15= Maximum Volume
Dynamic Brakes	52.28	0-15	28	--	0= Minimum Volume, 15= Maximum Volume
Spitter Valve	52.29	0-15	29	--	0= Minimum Volume, 15= Maximum Volume
Air Dryer	52.30	0-15	30	--	0= Minimum Volume, 15= Maximum Volume
Coupler	52.34	0-15	34	--	0= Minimum Volume, 15= Maximum Volume
Air Brakes	52.37	0-15	37	--	0= Minimum Volume, 15= Maximum Volume
Alternate Horn	52.40	0-15	40	--	0= Minimum Volume, 15= Maximum Volume
User Sound Effect 1	52.46	0-15	46	--	0= Minimum Volume, 15= Maximum Volume
User Sound Effect 2	52.47	0-15	47	--	0= Minimum Volume, 15= Maximum Volume
Verbal Read-Back	52.50	0-15	50	--	0= Minimum Volume, 15= Maximum Volume
Crew Talk	52.52	0-15	52	--	0= Minimum Volume, 15= Maximum Volume
Water Loading	52.53	0-15	53	--	0= Minimum Volume, 15= Maximum Volume
Fuel Loading	52.55	0-15	55	--	0= Minimum Volume, 15= Maximum Volume
Maintenance	52.56	0-15	56	--	0= Minimum Volume, 15= Maximum Volume

***** IMPORTANT: Changing the Prime Mover Master volume will *proportionately* increase/decrease all Prime Mover Component Volumes of that motor at once. To change the volume of individual component sounds within a motor, see the Component Volumes table, next page.

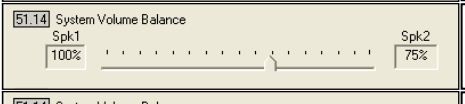
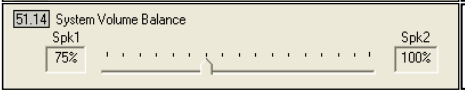
Diesel Prime Mover Component Volumes

The overall sound created by a diesel locomotive's Prime Mover is far more complex than that produced just by the motor itself. The motor, generator, exhaust, turbo, and in some cases, the knocking of rods in need of service, all come together to produce a sound our ear interprets as the "Prime Mover". Over the years we've learned that everyone has a different idea of what the "signature sound" of a specific Prime Mover is. The Titan's Component Volume CVs enable you to customize these volumes to your liking — and recreate the experience of being in the cab, standing outside next to it, or any combination of the two. Note that in the previous table, all of the Prime Mover Component Volume CVs have Idle, Mid, and Max settings (only Idle and Max for Turbo and Generator). This accommodates the *second* function of Component Volume CVs — which enable you to accurately emulate how a diesel locomotive *gets louder as it goes faster*. In this scenario the "Idle/Mid/Max" CVs are linked to the rpm of the loco, and enable you to adjust your volumes so that your loco is very quiet at low speeds, and gradually increases in volume as you increase the throttle — just like the real thing.

Stereo Balance Controls

QSI's first-in-the-industry *stereo sound* decoders give you infinite control over stereophonic sound modeling through the Master System Balance CV — as well as *individual* sound balance control CVs for *every* sound in the decoder! Example: If your loco has the horn mounted on the front of the locomotive, you can make that sound come *only* from the *front* of the loco! Stereo modeling creates a lush, three-dimensional sound environment that no other decoder on the market can duplicate — *and we encourage you to play with these settings*! Note that to maximize such stereo effects, you'll want to install your speakers as far fore and aft as possible for the greatest separation.

Programming Stereo Balance CVs: These CVs control how much volume goes to each speaker. Think of a home audio system balance control where "0" gives full volume to both speakers; moving it diminishes volume from one or the other. Here, Values 1-127 *remove* volume from Speaker 2 — i.e., the *higher* the value between 1 and 127, the *lower* the percentage of volume coming from *Speaker 2* will be. Similarly, values between 128 and 255 *remove* volume from *Speaker 1*; the *higher* the value between 128 and 255, the *lower* the percentage of volume from Speaker 1.

	In this picture **CV51.14 = 0** so the volume is balanced evenly between the two speakers.
	In this picture **CV51.14 = 127** so the volume is set to 100% of Speaker 1 and 0% of Speaker 2.
	In this picture **CV51.14 = 255** so the volume is set to 0% of speaker 1 and 100% of speaker 2.
	In this picture **CV51.14 = 31** so the volume is set to 100% of speaker 1 and 75% of speaker 2.
	In this picture **CV51.14 = 159** so the volume is set to 75% of speaker 1 and 100% of speaker 2.

Use the Individual Sound Balance CVs (Pg. 8) to assign the location of specific appliances on the engine (bell, horn, air pump) to their correct location. Note that as you move the stereo settings around, you will lose a bit of overall volume (since you've subtracted a percentage of it from one speaker). Once you've made your *stereo* adjustments you may want to go back and turn up some of the sounds. If you're using your decoder in a dual prime mover locomotive you can also balance each prime mover to its own channel to create the truly dramatic, spiraling dynamic that results when the two prime movers go in and out of phase with each other.

Prime Mover Component Volume CVs

Prime Mover 1 Component Volume	CV	CV127	CV49	CV50	CV127 Value Effect
Motor1 Idle	127.10.0	0-15	10	0	0= Minimum Volume. 15= Maximum Volume
Motor1 Mid	127.10.1	0-15	10	1	0= Minimum Volume. 15= Maximum Volume
Motor1 Max	127.10.2	0-15	10	2	0= Minimum Volume, 15= Maximum Volume
Exhaust1 Idle	127.10.10	0-15	10	10	0= Minimum Volume, 15= Maximum Volume
Exhaust1 Mid	127.10.11	0-15	10	11	0= Minimum Volume, 15= Maximum Volume
Exhaust1 Max	127.10.12	0-15	10	12	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust1 Idle	127.10.20	0-15	10	20	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust1 Mid	127.10.21	0-15	10	21	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust1 Max	127.10.22	0-15	10	22	0= Minimum Volume, 15= Maximum Volume
Rod Knock1 Idle	127.10.30	0-15	10	30	0= Minimum Volume, 15= Maximum Volume
Rod Knock1 Mid	127.10.31	0-15	10	31	0= Minimum Volume, 15= Maximum Volume
Rod Knock1 Max	127.10.32	0-15	10	32	0= Minimum Volume, 15= Maximum Volume
Generator1 Idle	127.10.60	0-15	10	60	0= Minimum Volume, 15= Maximum Volume
Generator1 Max	127.10.62	0-15	10	62	0= Minimum Volume, 15= Maximum Volume
Turbo1 Idle	127.10.70	0-15	10	70	0= Minimum Volume, 15= Maximum Volume
Turbo1 Max	127.10.72	0-15	10	72	0= Minimum Volume, 15= Maximum Volume
Prime Mover 2 Component Volume	CV	CV127	CV49	CV50	CV127 Value Effect
Motor2 Idle	127.11.0	0-15	11	0	0= Minimum Volume. 15= Maximum Volume
Motor2 Mid	127.11.1	0-15	11	1	0= Minimum Volume. 15= Maximum Volume
Motor2 Max	127.11.2	0-15	11	2	0= Minimum Volume, 15= Maximum Volume
Exhaust2 Idle	127.11.10	0-15	11	10	0= Minimum Volume, 15= Maximum Volume
Exhaust2 Mid	127.11.11	0-15	11	11	0= Minimum Volume, 15= Maximum Volume
Exhaust2 Max	127.11.12	0-15	11	12	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust2 Idle	127.11.20	0-15	11	20	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust2 Mid	127.11.21	0-15	11	21	0= Minimum Volume, 15= Maximum Volume
Labored Exhaust2 Max	127.11.22	0-15	11	22	0= Minimum Volume, 15= Maximum Volume
Rod Knock2 Idle	127.11.30	0-15	11	30	0= Minimum Volume, 15= Maximum Volume
Rod Knock2 Mid	127.11.31	0-15	11	31	0= Minimum Volume, 15= Maximum Volume
Rod Knock2 Max	127.11.32	0-15	11	32	0= Minimum Volume, 15= Maximum Volume
Generator2 Idle	127.11.60	0-15	11	60	0= Minimum Volume, 15= Maximum Volume
Generator2 Max	127.11.62	0-15	11	62	0= Minimum Volume, 15= Maximum Volume
Turbo2 Idle	127.11.70	0-15	11	70	0= Minimum Volume, 15= Maximum Volume
Turbo2 Max	127.11.72	0-15	11	72	0= Minimum Volume, 15= Maximum Volume

Individual Sound Balance Control CVs

Master Balance	CV	CV51	CV49	CV50	CV51 Value Effect
Master System Bal.	51.14	0-255	14	--	0= Speaker 1: 100% / Speaker 2: 100% 127= Speaker 1: 100% / Speaker 2: 0% 255= Speaker 1: 0% / Speaker 2: 100%
Individual Sound Bal. CVs	**CV**	**CV116**	**CV49**	**CV50**	**CV 116 Value Effect**
Horn	116.0	0-255	0	--	Same as CV51 Value Effect Above
Bell	116.8	0-255	8	--	Same as CV51 Value Effect Above
Prime Mover Master 1*	116.10	0-255	10	--	Same as CV51 Value Effect Above
Prime Mover Master 2*	116.11	0-255	11	--	Same as CV51 Value Effect Above
Air Pump	116.16	0-255	16	--	Same as CV51 Value Effect Above
Cooling Fans	116.19	0-255	19	--	Same as CV51 Value Effect Above
Long Air Let-off	116.21	0-255	21	--	Same as CV51 Value Effect Above
Short Air Let-off	116.22	0-255	22	--	Same as CV51 Value Effect Above
Squealing Brakes	116.24	0-255	24	--	Same as CV51 Value Effect Above
Dynamic Brakes	116.28	0-255	28	--	Same as CV51 Value Effect Above
Spitter Valve	116.29	0-255	29	--	Same as CV51 Value Effect Above
Air Dryer	116.30	0-255	30	--	Same as CV51 Value Effect Above
Coupler	116.34	0-255	34	--	Same as CV51 Value Effect Above
Air Brakes	116.37	0-255	37	--	Same as CV51 Value Effect Above
Alternate Horn	116.40	0-255	40	--	Same as CV51 Value Effect Above
User Sound Effect 1	116.46	0-255	46	--	Same as CV51 Value Effect Above
User Sound Effect 2	116.47	0-255	47	--	Same as CV51 Value Effect Above
Verbal Read-Back	116.50	0-255	50	--	Same as CV51 Value Effect Above
Crew Talk	116.52	0-255	52	--	Same as CV51 Value Effect Above
Water Loading	116.53	0-255	53	--	Same as CV51 Value Effect Above
Fuel Loading	116.55	0-255	55	--	Same as CV51 Value Effect Above
Maintenance	116.56	0-255	56	--	Same as CV51 Value Effect Above

*Just as with the Prime Mover 1 and 2 Volume Controls (Pg. 5), Prime Mover 1 and 2 Balance Controls adjust all components of a Prime Mover proportionately. To adjust balances of Prime Mover Components individually, see next page.

Prime Mover Component Sound Balance Control CVs

Prime Mover 1 Component Balance	CV	CV128	CV49	CV50	CV128 Value Effect
Motor1 Balance	128.10.0	0-255	10	0	Same as CV51 Value Effect, see previous page.
Exhaust1 Balance	128.10.10	0-255	10	10	Same as CV51 Value Effect, see previous page.
Labored Exhaust1 Balance	128.10.20	0-255	10	20	Same as CV51 Value Effect, see previous page.
Rod Knock1 Balance	128.10.30	0-255	10	30	Same as CV51 Value Effect, see previous page.
Generator1 Balance	128.10.60	0-255	10	60	Same as CV51 Value Effect, see previous page.
Turbo1 Balance	128.10.70	0-255	10	70	Same as CV51 Value Effect, see previous page.
Prime Mover 2 Component Balance	**CV**	**CV128**	**CV49**	**CV50**	**CV128 Value Effect**
Motor2 Balance	128.11.0	0-255	11	0	Same as CV51 Value Effect, see previous page.
Exhaust2 Balance	128.11.10	0-255	11	10	Same as CV51 Value Effect, see previous page.
Labored Exhaust2 Balance	128.11.20	0-255	11	20	Same as CV51 Value Effect, see previous page.
Rod Knock2 Balance	128.11.30	0-255	11	30	Same as CV51 Value Effect, see previous page.
Generator2 Balance	128.11.60	0-255	11	60	Same as CV51 Value Effect, see previous page.
Turbo2 Balance	128.11.70	0-255	11	70	Same as CV51 Value Effect, see previous page.

Setting up Dual Prime Mover Sounds

We're of the opinion that having the sounds of two prime movers without stereo is like having ice cream with no spoon. Sure, it's there but it's awfully hard to appreciate, and the result is always messy. With Titan decoders you can experience the *full drama of dual prime movers*. You'll hear each motor start and stop independently, and when running, spiral in and out of phase with each other, similar to the cylinders on an articulated steam locomotive. To accomplish this, you only need to set a couple of CVs, and you're ready to go.

Note: All Titan ET™ decoders (unless otherwise specified) have only the Prime Mover 1 volume initially activated, with 100% volume from both speakers. What we need to do is activate Prime Mover 2, then balance each motor to its own channel. To do this set the following:

Prime Mover 2 Master Volume CV52.11 = 11 (See pg. 5)
This will enable the second prime mover. If you're operating in mono (one speaker) then you're finished.

If you're operating stereo there are two more changes that will really make sounds sparkle:

Prime Mover 1 Master Balance CV116.10 = 127
Prime Mover 2 Master Balance CV116.11 = 255
This assumes that you have speaker 1 mounted in the front of your loco and speaker 2 mounted in the rear. If this is reversed, simply swap the values of CV's 116.10 and 116.11.

For more finite control you can use Component Volumes to move the individual component sounds in each Prime Mover to their specific location within the locomotive. This method is more time consuming but sometimes yields more "3D" results. Remember the key to getting truly impressive stereo is to place your speakers as far from each other as possible. However, don't let an inability to do so keep you from installing that second speaker; stereo offers the added benefit of "lessening the load" on each individual speaker as each no longer has to reproduce every sound coming from the locomotive. You'll find overall fidelity improves even if the speakers have to be mounted fairly close to each other.

Lighting Adjustments

QSI handles lighting a little differently than other decoder manufacturers. First, we do not call our lighting outputs "functions," as this is too easily confused with function buttons on DCC systems and, with most sound decoders, there is no correlation between a numerically labeled light function and a function button on a DCC system. Instead, our lights are called "Ports" and are programmed to operate automatically and *prototypically* based on research and experience with prototype locomotives. This frees up function buttons for sound control. Secondly, some other manufacturers give you a series of wires or solder connections (Ports) to which you then assign a lighting behavior. We do the opposite — with a series of lighting behaviors pre-programmed into the decoder to which you then assign a Port. This way, you have a wide variety of lights assigned by default — which allows you to simply connect the light (and any required resistor) and *go*. See your install guide for more information.

Quantum HO Titan decoders have 10 Light Ports. Quantum Large Scale Titans have 12.†
The behavior assigned to each light varies based on the software loaded in your decoder. Steam has its own lighting options, while Diesel, Gas Turbine, Electric and RDC have the same lighting options.
Each lighting behavior is represented by its own indexed CV. The variable value in the Master CV will be the actual Light Port Number shown in the installation guide. Due to this method of doing things, if you wish to change the behavior of a specific port, you must first "clear the Port" by setting the value of the default programmed behavior to 0.
Example: You want to put the Front Mars Light on Port 3 which, by default, is assigned to Front Left Ditch Light. In order to set the Front Mars Light to Port 3 you must first set the Front Ditch Light CV (115.84.0) to 0 and *then* set CV115.76.0 to 3.
For the location of specific Ports on your decoder, please see the Install Guide provided with your decoder at the time of purchase.

Light Behavior	CV	CV115	CV49	CV50	Default Port/Value of CV115
Headlight 1	115.70.0	0-10/12†	70	0	1
Headlight 2	115.70.1	0-10/12†	70	1	0
Reverse Light 1	115.73.0	0-10/12†	73	0	2
Reverse Light 2	115.73.1	0-10/12†	73	1	0
Front Mars Light	115.76.0	0-10/12†	76	0	5
Rear Mars Light	115.80.0	0-10/12†	80	0	0/8*
Front Left Ditch Light	115.84.0	0-10/12†	84	1	3
Front Right Ditch Light	115.84.1	0-10/12†	84	1	4
Rear Left Ditch Light	115.88.0	0-10/12†	88	0	0
Rear Right Ditch Light	115.88.1	0-10/12†	88	1	0
Front OHBL	115.92.0	0-10/12†	92	0	9
Rear OHBL	115.96.0	0-10/12†	96	0	0
Front Number Boards	115.100.0	0-10/12†	100	0	6
Rear Number Boards	115.102.0	0-10/12†	102	0	7
Front Marker Lights	115.104.0	0-10/12†	104	0	10
Rear Marker Lights	115.106.0	0-10/12†	106	0	0
Truck Lights	115.109.0	0-10/12†	109	0	0
Step Lights	115.113.0	0-10/12†	113	0	0
Front Cab Light	115.116.0	0-10/12†	116	0	0/12*
Rear Cab Light	115.118.0	0-10/12†	118	0	0
Engine Room Light 1	115.120.0	0-10/12†	120	0	0
Engine Room Light 2	115.121.0	0-10/12†	121	0	0
Cooling Fan	115.255.0	0-10/12†	255	0	11 (For Large Scale 10 amp)

***Large Scale Decoders Only. Configured for Smoke Units by Default**

Lighting Feature Configuration:

Titan decoders have more light Ports, and more CVs to customize them, than any other decoder — including function-only decoders. There are many more available options than we can possibly list in this manual. We strongly recommend you consult the complete DCC Users Manual at www.qsisolutions.com for detailed light configuration info. Some of the things you can change include:

- Initial control: QSI lights are set by default to work with LEDs* and to give prototypical response based on the action of the locomotive. This can be disabled, and all lights are mappable to individual function buttons.

  *If you're not using LEDs, the intensity settings may need to be changed to provide proper light response.
- Intensity settings: You can adjust the intensity (brightness) of the light in any potential state. For a headlight, for example, you can control how bright its brightest state is, and how dim its dimmest state. Using these controls, you can create Mars lights that oscillate perfectly (by also using the "mid intensity control"), and ditch lights that wink instead of blink!
- Ramp time controls: Want the light to come on instantaneously? Set these controls to 0. Conversely, if you want lights that respond more slowly and smoothly, set the control to 255 for a 2.55 second fade from off to on, or dim to bright.
- Four qualifying states: When using automatic control, the lights will respond to the action of the locomotive. You can configure lighting behavior for all four of the following states:
  - Neutral From Forward (NFF)
  - Neutral From Reverse (NFR)
  - Forward (FWD)
  - Reverse (REV)

All of these features, and more, are customizable using basic CV changes. Please consult the DCC Users Manual, or contact QSI Solutions for the exact CV settings and more information.

Throttle Mode Selection and Settings

Titan ET™ decoders offer two distinct throttle modes to enable highest quality operation of *all* locomotives.

Regulated Throttle Control [RTC] is the default setting for all QSI Solutions HO products. RTC provides many prototypical features such as ultra-slow speed, smooth starts and stops, power sharing in consist (to reduce speed matching between locomotives) and accurate load-responsive sounds. RTC utilizes the PID method of motor control, which sculpts the BEMF ("back electro-motive force") wave form, and reapplies it to the motor for ultra-smooth operation. Note that due to variances in model motors, RTC sometimes requires calibration to achieve optimal operation. But take our word for it — it is *always* worth it!*

Standard Throttle Control [STC] is the default setting for most QSI Solutions Large Scale Product and works more like a conventional DC power pack built into the decoder. It provides much more linear speed control, and as such, is more "plug and play" friendly.

Fine Tuning STC: In most STC cases, the locomotive will not run at speed step one straight out of the box. To tune your starting point, put the locomotive on the track, advance the throttle to Speed Step 1, and then using mainline or "ops mode" programming, increase the value of CV 2 on the main line until the locomotive just starts to move.

Fine Tuning RTC: RTC can require additional programming for smooth operation. Because of this we STRONGLY recommend use of a Quantum Programmer and Quantum CV Manager software. This will make programming the indexed CV values for PIDs substantially easier than entering the three CV values with your DCC handheld.

The most common PID "issue" is slow speed jerkiness. This can often be solved simply by increasing the start voltage (CV2, default 17), and the Regulated Throttle minimum BEMF (CV56.5, default 7). To increase this CV, set CV49 to a value of 5, and then set the value of CV56 to between 3 and 31.

Again, for complete instructions for calibrating PID behavior within RTC, please consult the complete DCC Users Manual at www.qsisolutions.com.

Diesel Motor Behavior Adjustments

ET™ gives you almost unimaginable CV-controlled customization of how your diesel responds. You can control how many DCC speed steps occur between each notch change, the scale miles–per-hour at which transitions occur, for how long the transitions occur, how long the loco will stand at idle before dropping into Low Idle or "Fuel Saver" mode... and more.

CV129.1.0 – Speed Steps Per Notch

ET™ allows you to determine the number of DCC speed steps that need to be input before your loco will change notch. The default setting is 15, which allows the loco to notch up realistically over the entire speed range on a DCC throttle in 128 Speed Step mode. Some users may prefer to change this setting based on their particular system. Example: The NCE Procab and Powercab have an "Increase/Decrease Fast" button that, in 128 SS mode, increase/decrease Speed Steps by 10 at a click. Many NCE users will set the Speed Steps Per Notch to 10, so that each click of this button will increase/decrease the notch the loco is in.

CV129.2.0 – Low Idle Timeout

Another ET exclusive is "Low Idle" or "Fuel Saver" mode, which is a feature included in many prototype locos today because of the high cost of fuel. It is also commonly used on locomotives regularly operated in cold climates to prevent diesel fuel from gelling in the tank. After startup, and once the locomotive has moved and returned to neutral, the automatic Low Idle timeout will begin. The default setting is 120 seconds, so after 2 minutes of inactivity, the locomotive will automatically drop into Low Idle. The loco will automatically return to normal idle if the throttle is advanced — or it can be manually returned from low idle by pressing F6 twice. To disable the automatic low idle timeout, simply set CV129.2.0 to a value of 0. CV129 has a range of 0-255, with each programmable value greater than 0 adding 1 second to the timer. Example: CV129.2.0=1. Automatic Low Idle Timeout will occur 1 second after returning to neutral following the first move. CV129.2.0=255. Automatic Low Idle Timeout will occur 4 minutes and 25 seconds after returning to neutral from the first move.

CV129.10.0 – Transition Motor Sound Effects

When a diesel locomotive is engaged, power is applied to the traction motors in *series*. This keeps the motors from overheating when starting a heavy load. Due to the generator's limited pressure capacity, the combined horsepower developed by the motor and generator will begin to drop off unless a "transition" is made — during which the power applied to the traction motors changes from *series* to *parallel*. Depending on the locomotive, this sometimes happens twice, and is either handled via an air-activated system, or as an electro-mechanical operation. We give you the ability to select which type of operation you prefer:

.

Type Of Transition	CV	CV129	CV49	CV50
No Transition Sound	129.10.0	0	10	0
Air Activated Transition Sound	129.10.0	1	10	0
Electro-Mechanical Transition Sound	129.10.0	2	10	0

CV129.50.0 and 129.51.0 Transition 1 and 2 SMPH

These two CVs dictate at what scale mile per hour the first, and (if used) second transition occurs. CV129.50.0 controls Transition 1; CV129.51.0 controls Transition 2. Both CVs have a range of 0-255; each increment is a single scale mile per hour. If using Transition 2, the value of CV129.51.0 must be greater than the value of CV129.50.0 (Transition 1).

CV129.55.0 Transition RPM Drop Time

During the time transition is occurring, the motor temporarily spools down in RPM as the engineer initiates the procedure. On older engines this could take several seconds while a series of relays and switches were thrown (the time it takes is often dictated by the skill and experience of the engineer). More modern locos employ an automatic transition which happens fairly quickly. Using CV129.55.0 you can control how long the motor spools down for before the transition is complete, and the motor begins to again spool up. CV129.55.0 has a range of 0-255 with each programmable unit representing .04 seconds. Example: CV129.55.0=1; RPM will drop off for only .04 seconds. CV129.55.0=255; the RPM will drop for 10.2 seconds. See how it works?

Customized Sound Functions and Scenarios

The Titan ET™ offers control of automatic signaling in the "Ready To Move" and "Grade Crossing" scenarios below.

"Ready To Move"

The Titan ET™ can provide automatic whistle, bell and lighting changes based on the state of the locomotive in two different types of "Ready-To-Move" scenarios: *Automatic Horn Blasts*, and *Bell-Triggered*. Either can be selected to trigger going from neutral to moving, moving to neutral, or both. The activation of these is handled by CV51.20 — "Motive State Change Warning Signals."

The timing of EVERY portion of these scenarios is customizable using CV120.

Automatic Horn Blasts: This scenario is fairly simplistic: the decoder measures the BEMF of the motor to determine what the loco is doing, and blows the appropriate horn signal accordingly: 2 horn blasts for FWD, 3 for REV and 1 blast when coming to a stop.

Bell Triggered Scenario: If you do a lot of switching, automatic horn blasts can become a little annoying — so we give you a more amenable method of triggering automatic horn blasts by using the bell as an indicator of what the locomotive is about to do. Below are the CV's to activate the two scenarios.

Action	CV	CV51	CV49
None	51.20	0	20
Automatic Horn Blast	51.20	17	20
Bell Triggered Scenario	51.20	34	20

The Bell Triggered Scenario follows a series of prototypical events once the bell is turned on in neutral. There are silent periods between each of these events that are configurable; in the real world this whole procedure can take more than a minute to complete. In order to truncate the period of time required, we have given you the ability to control these times. For the complete list of CVs that control the timing of the Bell Triggered Scenario, see the complete *DCC User's Manual* at www.QSISolutions.com.

Grade Crossing

Locomotive engineers need to alert roadway traffic that they're coming through — especially since locomotives take so much longer to stop than cars! To do so, engineers play a series of horn blasts prior to a road crossing to alert local traffic of their presence. Your Titan has this feature built in as a single button function (F15). Due to scale compression, you may want to change the length of time of the blasts and silent periods in between. We enable you to do this via CV55.154. Each blast and silent period is altered by changing the secondary index value. Each programmable unit represents 0.1 seconds.

Grade Xing Segment	CV	CV55	CV49	CV50	CV55 Value Effect
Horn Blast 1	55.154.0	0-127*	154	0	0=No horn/127=12.7 seconds*
Silent Period 1	55.154.1	0-255	154	1	0= No silence/255 25.5 second
Horn Blast 2	55.154.2	0-127*	154	2	0=No horn/127=12.7 seconds*
Silent Period 2	55.154.3	0-255	154	3	0= No silence/255 25.5 second
Horn Blast 3	55.154.4	0-127*	154	4	0=No horn/127=12.7 seconds*
Silent Period 3	55.154.5	0-255	154	5	0= No silence/255 25.5 second
Horn Blast 4	55.154.6	0-127*	154	6	0=No horn/27=12.7 seconds*

***To play a "hoot" instead of a very short blast, reduce the final CV55 value to <10 and add 128. To add a "fancy ending" to a blast, add 128 to any final CV55 value >10.**

Hoot Example: To get a "hoot" on Horn Blast 3, set CV55.154.4 to a value of 137 (9 + 128 = 137)

Fancy End Example: Using the final blast (Horn Blast 4) as an example, set CV55.154.6 = 148. This will give a 2 second horn blast that culminates in the fancy ending.

Function List

Please keep in mind that the following applies *exclusively* to DCC users!
F0: Toggles Light Ports assigned to the group "multiple lights 1"
F1: Toggles Bell On or Off
F2: Toggles Horn On or Off (also toggles alternate horn after triggered using F11)
F3: Plays Coupler sounds.
F4: Toggles Cooling Fans On or Off
F5: No effect in Neutral; while moving toggles Dynamic Brake sounds. Dynamic Brakes are speed dependent, and will not engage until the locomotive is moving at least 9 SMPH.
F6: Two quick presses in succession will start locomotive up from shutdown, **or revive it from any partial shutdown state. If your loco is making sound but not moving, try pressing F6 twice.** Also triggers Doppler effects when moving in forward or reverse, causing all locomotive sounds to "Doppler down." This can be especially fun at the end of a grade crossing, or when used in conjunction with other sound effects.
F7: While moving, drop the throttle to ss zero; now, with the loco coasting, push F7 to *prototypically engage the brakes.* This is far more realistic than other decoder-based braking methods *because an engineer would never engage the brakes with the throttle open at main line speed!*
F8: Mute.
F9: *In neutral* puts loco in disconnect/standby/shutdown modes. *Press 2x for disconnect:* In disconnect you can throttle the motor up and down but the loco will not move, this is similar to an engineer moving the throttle lever without first setting the direction selection lever. *Press 4x for standby*: In standby the locomotive will drop into "low idle" (for a description of low idle, see Pg. 12). *Press 6x for full shutdown*: This will take the locomotive through a series of shutdown procedures which you will hear, ending with the engineer closing some hatches and turning off the lights, before the cab door finally bangs shut, indicating that the loco is done for the day! **IMPORTANT NOTE: ACTIVATING THESE FUNCTIONS CAN CAUSE THE LOCO TO NO LONGER RESPOND TO THROTTLE INPUT. TO RECOVER FROM ANY OF THESE STATES SIMPLY PRESS F6 TWICE.**
F9: *When moving* activates the Sound of Power function. When sound of power is activated, you'll hear the horn hoot once. As you throttle up, the loco will sound as though it's laboring under a very heavy load; when you throttle down, you'll hear the motor drop down like it's coasting. *Neither of these operations will affect actual speed until F9 is pressed again* — when you'll hear a double horn hoot indicating that Sound Of Power has been turned off (so be sure and remember your original speed!).
F10: Status Report. This is a very helpful troubleshooting tool. If your loco starts up and makes sounds, but does not respond to throttle input, push F10 while in Neutral. The loco will speak out the programmed address, followed by either "Disconnect," "Standby" or "Shutdown." If it reports any of these, press F6 twice to revive it. It may also say "Consist." If it does, the locomotive has been programmed into Consist Mode; to clear it, program CV19 to a value of 0.
F10 *also acts as a speedometer* when moving, providing verbal read back of your loco's scale miles per hour.
F11: Toggles between the primary and secondary horn. After pressing **F11** once **F2** will control the secondary horn normally.
F12: Toggles extra light functions in the group "Multiple Lights 3" on or off.
F13: System Volume Decrease by 2db
F14: System Volume Increase by 2db
F15: While stopped, plays a short air let off; while moving, plays the Grade Crossing horn sequence
F16-25: Reserved for user assignment
F26: Fuel Loading Scenario
F27: Maintenance Scenario
F28: Water Loading Scenario

Expand the potential of your Titan with the Quantum Programmer.

The Quantum Programmer USB device is compatible with all Windows operating systems up to Windows 8 (Windows 8 support coming soon) and allows you to do the following:

- **Easily Program Indexed CVs using check boxes, drop down menus, and sliders.**
- **Update sound files in your loco, change your decoder's personality as much as you like or take advantage of fun new functions and features from QSI Solutions.**
- **Easily calibrate your locos for optimum sound response and operating quality.**
- **Add your own custom sounds.**
- **Create a CV roster for all your engines.**
- **Update the "default" CVs so a DCC system scramble doesn't potentially undo all your programming work.**
- **And much, much more.**

Talk to your Dealer about a Quantum Programmer today!

Have questions? Feature Suggestions? Sound Requests? We, at QSI and QSI Solutions, pride ourselves on unmatched customer service and strive to integrate customer requests into our products more so than any other decoder manufacturer. Please contact us with your needs and wants!

Phone: 802-448-9899
Fax: 802-440-3073
Email: Info@QSISolutions.com

This Decoder is protected under a limited warranty provided by the manufacturer, please see the installation guide for the short form warranty or www.QSISolutions.com for complete warranty information.

Diesel Titan-ET Programming Guide.
Ver. 1.3 © 1/2014 Quantum Rail Products.