



TITAN Q2-FX

Steam Programming Guide



Sound Set Id#:

-

Small

Medium

Large

Articulated

Notes:

EXPERIENCE THE

STEREO

DIFFERENCE

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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 QSI Solutions to get a copy.

Introduction

2.

Congratulations on your purchase of a Q2-FX Quantum Titan. This new technology allows for a greater combination of prototype sounds than ever previously available in one decoder. You have in your hands the most flexible piece of model rail technology in the known universe. We strive to set the decoder up as realistically as possible from the factory but you may desire to tweak some of the settings to truly customize your experience. This guide is designed to walk you through the most common programmable elements within the decoder but there are many more features than can be covered in a document of this size, the remainder of the features not described herein can be found in our Full DC/DCC Reference Manual on our website.

Our Philosophy

At QSI Solutions we take user request for features and sounds very seriously and work to incorporate these requests more than any other decoder manufacturer. This is one of the primary reasons we believe in an upgradeable product. This way, users who have already installed a decoder can take advantage of new features 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 flash memory is used in just about every electronic device you touch, we feel it's a dirty trick to force you to buy a new decoder every time we add support for a new feature or release a new sound file that you want.

Before We Begin

In order to proceed with programming your locomotive you will need a method of actually sending the programming information. This guide is specifically aimed at DCC users as this is a DCC decoder. It is *functional* on DC analog layouts but the programming options are more limited as 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. DC operators who wish to have full programming capability are encouraged to purchase a Quantum Programmer.

The Titan series of decoders have many more features than any other decoder available today. Due to this fact, there is occasionally more programming required to get the specific features you're looking for activated. Our hope is that this manual covers most of the questions that you'll encounter but as we do recommend that all users at least familiarize themselves with the full DCC reference manual located here:

http://www.qsisolutions.com/pdf/QuantumDCCRefManual_5_1_0.pdf

The full DCC reference manual will give you complete information on all of the various features and settings that are available in the decoder. If you have additional questions or do not understand something in either the full manual, or any of our literature please do not hesitate to contact us for assistance. We pride ourselves on unrivaled customer service, whether you've purchased 1 decoder or 100 we want to help you best understand, operate, and appreciate our products.

We do ask that you 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 the decoder to factory default specifications. All QSI decoders have a manual reset which can be completed by shorting two contact points together and the applying power but you can also use basic DCC CVs to reset. The CVs are to be entered in the following order.

1: CV50=255

2: CV49=128

3: CV56=113

After entering the 3rd CV we recommend you "cycle the power" to the locomotive by turning the power off and back on again, you can also accomplish this by rocking one side of the engine off the track and putting it back down. The locomotive should then respond again to address 3 and you should hear the word "reset" spoken by the decoder. For information on manually resetting your decoder using the above mentioned jumper contacts please see the hardware installation guide provided with your decoder at the time of purchase.

Using (and understanding) “Indexed CVs”

3.

The flipside of our continuously growing list of features is the challenge 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 simply 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 to your liking 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.

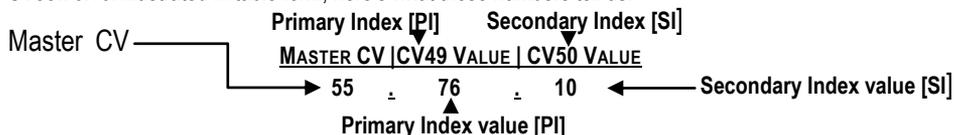
Rule 2: In any indexed CV, *only* the Master CV can be programmed to control a given function.

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 CV56, you have to *first* enter the decimal values shown in its formula into its Primary and Secondary indexes – CV 49 and CV 50 – 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 (with a default value of 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 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 have access to CV51’s 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 Address: If you're going to use a short address (between 1 and 127) you can simply enter that address as the value of CV1.

CV: 17/18 Extended Address: CVs 17 and 18 are known as a high byte-low byte or "paired" CV, meaning that the two CVs together hold one piece of information. If your DCC system does not compute the values of CV17/18 for you†, here is a way to compute the values, by using a different value in each CV to "build" the address you want. To determine the values that are placed into these CVs use the following equation.

- A. Start with the locomotive address; divide it by 256 **Sample** $4449 \div 256 = 17.379$
- 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** $17 \times 256 = 4352$
- 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. To activate 4 digit addressing; program CV-29 to one of the 4 digit address values shown in the table below.

† If your DCC System fails to correctly set the long address using a DCC system specific "auto address program" function disable the 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.

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

Sound Adjustments

There are whole hosts of sound control CVs that are user adjustable. Sound control CVs are broken into two groups; Volume and Stereo Balance, which are each broken into two more sub groups; Individual Sound Control and Component Sound Control. Individual Sounds cover all the general sounds in the decoder. Component sounds cover the specific pieces that make up the Prime Mover sound; there are dedicated sets of Component Sound controls for both Prime Mover sounds.

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
Whistle	52.0	0-15	0	--	0= Minimum Volume. 15= Maximum Volume
Bell	52.8	0-15	8	--	0= Minimum Volume, 15= Maximum Volume
Chuff 1	52.10	0-15	10	--	0= Minimum Volume, 15= Maximum Volume
Chuff 2*	52.11	0-15	11	--	0= Minimum Volume, 15= Maximum Volume
Valve Rod Clank	52.13	0-15	13	--	0= Minimum Volume, 15= Maximum Volume
Cylinder Cocks	52.15	0-15	15	--	0= Minimum Volume, 15= Maximum Volume
Air Pump 1	52.16	0-15	16	--	0= Minimum Volume, 15= Maximum Volume
Air Pump 2	52.17	0-15	17	--	0= Minimum Volume, 15= Maximum Volume
Blower Hiss	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
Dynamo	52.26	0-15	26	--	0= Minimum Volume, 15= Maximum Volume
Popoff Valve	52.29	0-15	29	--	0= Minimum Volume, 15= Maximum Volume
Blowdown	52.30	0-15	30	--	0= Minimum Volume, 15= Maximum Volume
Injector	52.31	0-15	31	--	0= Minimum Volume, 15= Maximum Volume
Fuel Sounds	52.32	0-15	32	--	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 Whistle	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
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
Water Scoop	52.54	0-15	54	--	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

*Articulated Engines Only

Stereo Balance Controls

6.

QSI's addition of stereo to a mobile sound decoder is an industry first! The user has very finite control over the stereo through the master system Balance CV and *individual* sound balance control CV's for every sound in the decoder. Example; if your loco has the Whistle mounted on the front of the locomotive, you can get that sound *only* from the *front* of the loco! If using stereo it is recommended that you install your speakers as far fore and aft as possible for the greatest separation and therefore most dynamic effect.

Stereo balance CV's are programmed in the following manner: Values 1-127 *remove* volume from Speaker 2, the higher the value between 1 and 127 the *lower* the volume percentage coming from Speaker 2. Conversely; values between 128 and 255 *remove* volume from Speaker 1, the higher the value between 128 and 255 the *lower* the volume percentage coming from Speaker 1.

<p>51.14 System Volume Balance</p> <p>Spk1 100% Spk2 100%</p>	<p>In this picture CV51.14 = 0 so the volume is balanced evenly between the two speakers.</p>
<p>51.14 System Volume Balance</p> <p>Spk1 100% Spk2 0%</p>	<p>In this picture CV51.14 = 127 so the volume is set to 100% of Speaker 1 and 0% of Speaker 2.</p>
<p>51.14 System Volume Balance</p> <p>Spk1 0% Spk2 100%</p>	<p>In this picture CV51.14 = 255 so the volume is set to 0% of speaker 1 and 100% of speaker 2.</p>
<p>51.14 System Volume Balance</p> <p>Spk1 100% Spk2 75%</p>	<p>In this picture CV51.14 = 31 so the volume is set to 100% of speaker 1 and 75% of speaker 2.</p>
<p>51.14 System Volume Balance</p> <p>Spk1 75% Spk2 100%</p>	<p>In this picture CV51.14 = 159 so the volume is set to 75% of speaker 1 and 100% of speaker 2.</p>

Use the Individual Sound Balance CVs to set the location of specific appliances on the engine to their correct location. Remember that as you move the stereo settings around you will lose a little bit of overall volume since you've subtracted a certain percentage of it from one speaker channel. so once you've made your stereo adjustments you may desire to go back and turn up some of the sounds. The effect of stereo tuning makes for a lush three dimensional sound environment that can't be matched by any other decoder on the market so we encourage you to play with these settings.

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
Whistle	116.0	0-255	0	--	Same as CV51 Value Effect Above
Bell	116.8	0-255	8	--	Same as CV51 Value Effect Above
Chuff 1	116.10	0-255	10	--	Same as CV51 Value Effect Above
Chuff 2*	116.11	0-255	11	--	Same as CV51 Value Effect Above
Valve Rod Clank	116.13	0-255	13	--	Same as CV51 Value Effect Above
Cylinder Cocks	116.15	0-255	15	--	Same as CV51 Value Effect Above
Air Pump 1	116.16	0-255	16	--	Same as CV51 Value Effect Above
Air Pump 2	116.17	0-255	17	--	Same as CV51 Value Effect Above
Blower Hiss	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
Dynamo	116.26	0-255	26	--	Same as CV51 Value Effect Above
Popoff Valve	116.29	0-255	29	--	Same as CV51 Value Effect Above
Blowdown	116.30	0-255	30	--	Same as CV51 Value Effect Above
Injector	116.31	0-255	31	--	Same as CV51 Value Effect Above
Fuel Sounds	116.32	0-255	32	--	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 Whistle	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
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
Water Scoop	116.54	0-255	54	--	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

*Articulated engines only.

Synchronizing The Chuff Responses:

8.

Titan Decoders utilize the driver diameter and the scale speed of your loco to set your chuff rate. The scale speed is calculated from the BEMF generated by the motor. This assures that the chuff rate will stay in sync throughout the speed range.

The wheel diameter is entered by programming two CV's: CV 56.26.0 and CV 56.26.1

1) You need to determine the size of your driving wheel in full scale inches. It is important to measure for this value and not enter information provided by a model manufacturer or historical document as the final wheel of the model is often not 100% to prototypical scale.

2) If you do not have a model railroad scale ruler then you can use an accurate micrometer that can measure at least to 0.01 in. (1/100")

Multiply your measurement in inches by the appropriate ratio in the table below

Scale	Ratio
HO	1:87
S	1:64
O	1:48
G	1:29

Example:

Your G Driver measures 1.44" so your full scale driver diameter is $1.44 \times 29 = 41.76"$.

Round off the 41.76" to the nearest inch=42", Full Scale Driver Diameter.

Once you have the diameter you can determine the values of the two CV's most easily by using the **Table on the next page** and selecting the values for **CV 56.26.0** and **CV 56.26.1**

Alternately, if you choose not to use the table, once you have the diameter you can determine the values of the two CV's, by using the equations below. In our example we're setting the CV'S for a 32" driver as we determined above.

1) **Multiply** the diameter in inches by **100** so in this case: $32.00 \times 100 = 3200$

2) Now Divide the 3200 by 256 (and drop any decimal value) so: $3200 / 256 = 12$.

12 is the value that is programmed into CV 56.26.1

3) To determine the value of CV56.26.0, you will multiply the value you determined for CV 56.26.1 (in this case **12**) by 256 so: $12 \times 256 = 3072$.

4) Subtract this 3072 from your first calculation value (in this case 3200) so: $3200 - 3072 = 128$.

128 is the value which is programmed into CV56.26.0.

5) To Program these CV's you enter the following CV's as shown on the table below.

Full CV	CV56	CV49	CV50
56.26.0	Example Value is 128. You will program the quotient from Step 2, OR the value shown in the table on the next page, as the final CV56 value.	26	0
56.26.1	Example Value is 12 You will program the difference from Step 4, OR the value shown in the table on the next page as the final CV56 value.	26	1

Continued on next page →

Synchronizing The Chuff Responses Continued:

Wheel Dia Inches	CM	CV56.26.0	CV56.26.1
24	60.9	96	9
25	63.5	196	9
26	66	40	10
27	68.5	140	10
28	71.1	240	10
29	73.6	84	11
30	76.2	184	11
31	78.7	28	12
32	81.2	128	12
33	83.8	228	12
34	86.3	82	13
35	88.9	172	13
36	91.4	16	14
37	93.9	116	14
38	96.5	216	14
39	99	60	15
40	101.6	160	15
41	104.1	4	16
42	106.6	104	16
43	109.2	204	16
44	111.7	48	17
45	114.3	148	17
46	116.8	248	17
47	119.3	92	18
48	121.9	192	18
49	124.4	36	19
50	127	136	19
51	129.5	236	19
52	132	80	20
53	134.6	180	20
54	137.1	24	21
55	139.7	124	21
56	142.2	224	21
57	144.7	68	22
58	147.3	168	22
59	149.8	12	23
60	152.4	112	23

Wheel Dia Inches	CM	CV56.26.0	CV56.26.1
61	154.9	212	23
62	157.4	56	24
63	160	156	24
64	162.5	0	25
65	165.1	100	25
66	167.6	200	25
67	170.1	44	26
68	172.7	144	26
69	175.2	244	26
70	177.8	88	27
71	180.3	188	27
72	182.8	32	28
73	185.4	132	28
74	187.9	232	28
75	190.5	76	29
76	193	176	29
77	195.5	20	30
78	198.1	120	30
79	200.6	220	30
80	203.2	64	31
81	205.7	164	31
82	208.2	8	32
83	210.8	108	32
84	213.3	208	32
85	215.9	52	33
86	218.4	152	33
87	220.9	252	33
88	223.5	96	34
89	226	196	34
90	228.6	40	35
91	231.1	140	35
92	233.6	240	35
93	236.2	84	36
94	238.7	184	36
95	241.3	28	37
96	243.8	128	37
97	246.3	228	37

For most users this is all you need to do to set your chuff rate. If you desire to fine tune things more you must calibrate the loco for scale speed. This is done by adjusting CV56.7.0-1, as this is another dual byte CV we have added a function assignable calibration procedure to make things easier.

As we mentioned before. The other part of the Chuff Synchronization comes from the decoder knowing roughly the scale speed of the loco. If you have a Quantum Programmer this task is done a little easier. We'll quickly outline the steps to this process. 1st. you will need to program the your odometer to give the decoder some parameters to work with. 2nd. measure out four feet of straight track. You'll want a little track at either end to use so you have room to start and stop the loco but you'll need a measured 4 feet. 3rd, assign the "Calibrate BEMF to SMPH" to a function key. We'll use function 3. 4th, you simply start place the loco at the start line and push F3, run it and try to stop it exactly at the finish line then push F3 again. When the loco reports the scale feet accurately you can reset the functionality of F3 and your calibration process will be complete. The next page outlines these steps in detail with appropriate CV values.

We will be using HO scale measurements for our example. In order for this procedure to be effective you must have first set your driver diameter.

Step 1: Program The Odometer: All Titan Decoders have an onboard odometer. This is used for a variety of measurements and operations but is crucial to this calibration procedure. We have picked 4' as a good value distance for calibration. You may want to set the distance longer or shorter depending on your loco and available track but don't go too short, the loco needs to stretch its legs a little in order to get the measurements we need. We need to enter distance in scale feet so convert your measurement to scale by multiplying $4 \times 87 = 348$. This is programmed as a high byte low byte CV similar to long address or driver diameter. To set this at 348 scale feet program CV52.20.0=92 then CV52.20.1=1

Step2: Assign the "Calibrate BEMF to SMPH" function to F3: You only need to set this to function in neutral as you'll be engaging it prior to starting the loco and disengaging it after stopping it. To assign this to Function 3 set CV53.5.1=200

Step3: Measure 4' of track and mark the start and stop points.

Step4:Run the Engine: Place your locomotive at the starting line you've marked on your track. Press function 3 and you'll hear the engine say "Calibration Started" and the bell will begin to ring. Throttle the loco up to a medium speed, typically speed step 30 or 40 will suffice, you just need to get it going fast enough that the decoder is getting a clean, steady, reading of the BEMF signal coming from the locomotive.

Step4: Stop the Engine: Once you have gotten your loco to mid speed start decreasing the throttle. The aim is to stop the loco dead on the stop line you marked out in Step 3. This can sometimes take a couple tries to get the engine to stop exactly where you like. If you need to start the process over again make sure to turn F3 off and back on again and return the engine to the starting line you established in Step 3. Once you get the engine to stop at the stopping line push Function 3 again. You will hear the engine speak "Calibration Finished" and the scale feet it traveled. The idea here is to get it to speak out as close to the 348 scale feet we programmed in Step 1. When it reads out either dead on or very close to 348 feet (typically a 5-10 foot margin of error still yields very good results) the loco will be speed calibrated.

Step5: Reassign F3 to default functionality: Now that the loco has been calibrated you can return F3 to its default state or whatever other value you may like. To set it back to default set CV53.5.1=211 and you will reactivate the coupler crash sounds.

Once this calibration is completed the decoder will now know how big your wheels are *AND* how fast it's going at a given BEMF reading which means it can very accurately calculate what 4 chuffs per revolution should be. Test it out. If you're unhappy with the results, repeat steps 2, 3 and 4, until you get the read back closer to the 348 scale feet you've programmed.

QSI handles lighting a little differently than other decoder manufacturers. First off, we do not call our lighting outputs “functions” as this is too easily confused with function buttons on a DCC system 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 findings from real locomotives. This frees up function buttons for sound control. Secondly, some other manufacturers give you a series of wires or solder connections (Ports) that you then assign a lighting behavior to, we do the opposite. We have a series of lighting behaviors pre-programmed into the decoder to which you then assign a Port. This way, we can have a wide variety lights assigned by default allowing you to simply connect the light (and any required resistor, see your install guide for more information) and go.

HO Quantum Titan decoders have 10 Light Ports. Large Scale Quantum Titans have 12.†

The behavior assigned to each light varies based on the software loading in your decoder. Steam and Diesel have different lighting options. Diesel, Gas Turbine, Electric, and RDC all 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 a specific Port 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
Reverse Light 1	115.73.0	0-10/12†	73	0	2
Front Mars Light	115.76.0	0-10/12†	76	0	3/6
Front Number Boards	115.100.0	0-10/12†	100	0	4
Front Marker Lights	115.104.0	0-10/12†	104	0	5
Rear Marker Lights	115.106.0	0-10/12†	106	0	6/7
Front Cab Light	115.116.0	0-10/12†	116	0	7/3
Rear Cab Light	115.118.0	0-10/12†	118	0	8/12*
Firebox Flicker 1	115.122.0	0-10/12†	122	0	9*
Firebox Flicker 2	115.122.1	0-10/12†	122	1	10
Cooling Fan	115.255.0	0-12	255	0	11

Items with multiple assignments are HO Scale/Large Scale. *Configured for Smoke Units

Lighting Feature Configuration:

12.

The Titan decoder series has more light Ports and more CV's to customize those light Ports than any other decoder, even function only decoders. There are so many options that we simply cannot list them all in this manual. We strongly recommend that you look at the complete DCC Users Manual posted at www.qsisolutions.com for more information on how to best setup your lights. Some of the things you can change are:

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

*If not using LED's 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 so for a headlight you have control over how bright the brightest state is, and how dim the dimmest state is. With these controls you can get Mars lights that oscillate perfectly (using also the "mid intensity control") and ditchlights that wink instead of blink

Ramp time controls, want the light to come on instantaneously? Set these controls to 0. Conversely, if you desire to have your lights work slower and more smoothly you can set the control to 255 for a 2.55 second fade from off to on, or dim to bright.

4 qualifying states, when using automatic control the lights will respond to the action of the locomotive. You can have different 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 reference manual, or contact QSI Solutions for the exact CV's and more information.

Throttle Mode Selection and Settings

The QSI decoders feature two different throttle modes to allow for high quality operation on all locomotives.

Regulated Throttle Control [RTC] has been the default setting for all QSI products. RTC provides many nice features such as: Ultra Slow Speed, Smooth Starts and Stops, Power sharing in consist to reduce speed matching between locomotives, accurate load responsive sounds

RTC works the way it does utilizing PID method of motor control which sculpts the BEMF wave form and reapplies it to the motor for ultra-smooth operation. It should be noted that due to differences in model motors it can occasionally require calibration to achieve optimal operation.

Standard Throttle Control [STC] works more like a conventional DC power pack built into the decoder. It provides for much more linear speed control and as such is more "plug and play" friendly.

The default CV for throttle mode selection (CV56.4) is set at value 1 for RTC in all HO decoders and value 0 for STC in all Large Scale decoders. To change this back to RTC simply set CV49 to a value of 4 and then CV56 to a value of 1.

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 more programming for smooth operation. Because of this we STRONGLY recommend using a Quantum Programmer and the Quantum CV Manager software as it will make programming of the indexed CV values for PIDs substantially easier then entering all three CV values with your DCC handheld.

The most common PID issue is slow speed jerkiness. This can often be solved by simply 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 increase the value of CV56 to anywhere between 3 and 31.

For the full write up on how to calibrate PID behavior within RTC we recommend you consult the Full DCC Reference Manual For All QSI Decoders located at www.QSISolutions.com.

CV: 2 V-start (Start Voltage): CV 2 determines the amount of voltage applied to the motor when the throttle is first increased. If your locomotive does not start smoothly you will need to increase the value of CV 2, also if the loco starts smoothly but does not visibly change speed between speed step 1 and 20 you will need to increase the value of CV 2. Use CV 2 also when trying to match the starting speed of two locomotives which will be run together.

CV: 5 V-high (top speed): CV 5 sets a maximum voltage for the motor to any value between 2 and 255. A value of 0, 1, or 255 provides maximum motor voltage at maximum throttle.

The value of CV 5 determines the maximum motor drive as a fraction of the applied voltage as defined by the following equation:

Maximum Motor Voltage = (Track Voltage) x (CV5/255)

For instance, a value of "200" for CV 5 means that the maximum voltage will be 217/255 or 85% of the applied track voltage.

Use CV 5 also when trying to match the top speed of two locomotives which will be run together.

CV: 6 V-mid (mid speed): CV 6 determines the voltage drive level applied to the motor halfway between minimum and maximum throttle. Use CV6 in conjunction with CV 2 and CV 5 as a simple means of defining a speed table. Using these three CV's you should be able to get two locomotives to run fairly close to each other in a consist.

Momentum and Sound Response

The Titan series of steam decoders has the ability (unlike any other decoder) to simulate the effect of Cut Off being applied to the chuff. Ideally, we would have a second, variable throttle input in order to handle positioning the cut off lever or "Johnson bar" but unfortunately there is no DCC manufacturer yet who has built a system that accommodates this. Since the cut off lever was used directly in proportion to the load the engineer was trying to use, we utilize momentum CVs to equate positioning of the Johnson bar. By setting momentum and then rapidly increasing the throttle you are, in essence, asking the locomotive to try very hard to move a huge load. The decoder sees the discrepancy between the throttle setting (speed step) and the BEMF measured from the motor (actual speed of the loco) and responds by giving you a huge "barking" chuff just like a real steam engine. As your model gains speed and begins to reach the target speed setting dictated by your throttle position the chuff will start to gradually die down in volume and intensity until it reaches a fairly mellow "cruising" chuff. Conversely, if you are cruising at speed and drop the throttle, the chuff will all but disappear and you'll be left with the bang of the side rods as the engine coasts down in speed. During these deceleration times you can also utilize QSI's working brake function to slow the actual speed of the engine more rapidly. Momentum is stored in CVs 3, 4, 23, and 24 with CVs 3 and 23 governing acceleration momentum and CVs 4 and 24 governing deceleration momentum. The greater the amount of momentum the more dramatic the difference in chuff intensity under rapid acceleration/deceleration states.

The Titan also contains a few automatic signaling sounds. The first is the “Ready To Move” scenario is used for signaling the a locomotive that is ready to pull out of the station or has just returned to one. The second is the “Grade Crossing” which is a series of whistle signals played when the tracks cross the road to warn nearby motorists of a train.

“Ready To Move”

The Quantum Titan can provide automatic whistle, bell and lighting changes based on the state of the locomotive. There are two different types of Ready To Move Scenarios; Automatic Whistle Blasts, and a Bell Triggered Scenario. Either one of these can be selected to trigger when going from neutral to moving, moving to neutral or both. The activation of these is handled by CV51.20 “Motive State Change Warning Signals”

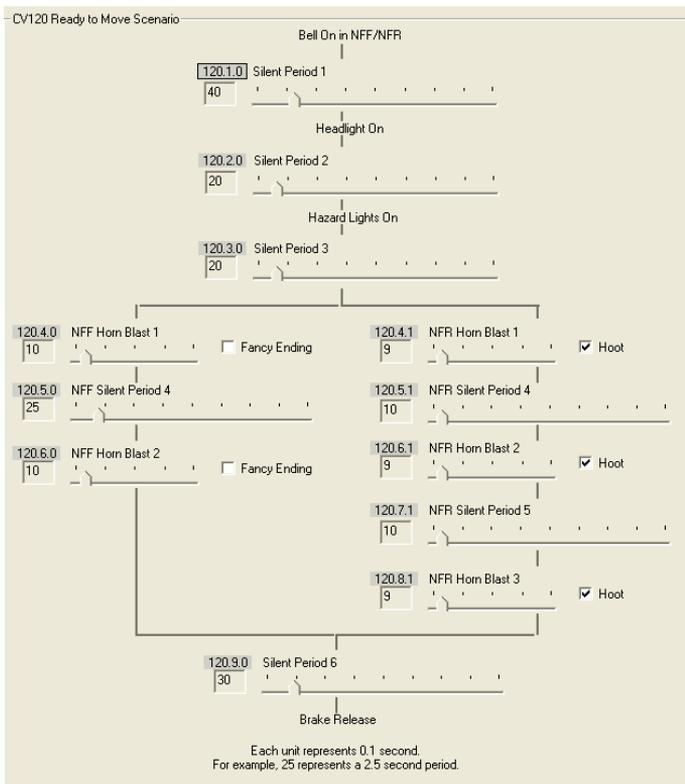
The timing of EVERY portion of these scenarios is customizable. Using CV120.

Automatic Whistle 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 whistle signal accordingly. 2 whistles blasts for FWD, 3 whistle hoots for REV and 1 whistle blast when coming to a stop.

Bell Triggered Scenario: If you do a lot of switching the automatic Whistle blasts can get a little annoying so we give you a more useable method of triggering the automatic blasts. 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 Whistle Blast	51.20	17	20
Bell Triggered Scenario	51.20	34	20

Below is a shot from our CV Manager software showing the steps the decoder goes through during the “Bell Triggered Scenario”



The Bell Triggered scenario follows a series of prototypical events once the bell is turned on 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 that period of time we have given you the ability to set the times. Below is a table that outlines the motions of the Ready To Move scenario and the CV's used to control it. Advancing the throttle at any time during this scenario will disable it and the loco will respond normally to throttle input.

Rdy To Move Segment	CV	CV120	CV49	CV50	CV120 Value Effect
Bell on in NFF/NFR					
Silent Period 1	120.1.0	0-255	1	0	0= No silence/255 25.5 second
Headlight On					
Silent Period 2	120.2.0	0-255	2	0	0= No silence/255 25.5 second
Hazard Lights On					
Silent Period 3	120.3.0	0-255	3	0	0= No silence/255 25.5 second
If in FWD					
NFF Whistle Blast 1	120.4.0	0-127*	4	0	0=No Whistle/127=12.7 seconds*
NFF Silent Period 4	120.5.0	0-255	5	0	0= No silence/255 25.5 second
Whistle Blast 2	120.6.0	0-127*	6	0	0=No Whistle/27=12.7 seconds*
If in REV					
NFR Whistle Blast 1	120.4.1	0-127*	4	1	0=No Whistle/127=12.7 seconds*
NFR Silent Period 4	120.5.1	0-255	5	1	0= No silence/255 25.5 second
NFR Whistle Blast 2	120.6.1	0-127*	6	1	0=No Whistle/127=12.7 seconds*
NFR Silent Period 5	120.7.1	0-255	7	1	0= No silence/255 25.5 second
NFR Whistle Blast 3	120.8.1	0-127*	8	1	0=No Whistle/127=12.7 seconds*
Silent Period 6	120.9.0	0-255	9	2	0= No silence/255 25.5 second
Brake Release					

Grade Crossing

Locomotive engineers need to let road borne traffic know when they're coming through, as we know locomotives take much longer to stop than cars do! To do this, engineers play a series of whistle blasts prior to crossing the road to alert oncoming drivers of their presence. The Titan has this feature built in as a single button function. Due to scale compression, some users may desire to change the length of time of the blasts and silent periods in between. We enable you to do this via CV55.154 with each blast and silent period being selected by changing the secondary index value. Each programmable unit represents 0.1 seconds.

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

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

Hoot Example: To get a "hoot" on the Whistle Blast 3 CV55.154.4 would be set to a value of 137 for (9, the number less than 10, + 128)

Fancy End Example: Using the final blast (Whistle Blast 4) as an example; set CV55.154.6 = 148, this will give you a 2 second Whistle blast culminating in the fancy ending.

Onboard Library CV's

16.

The Quantum Titan comes equipped with a huge variety of sounds stored immediately on the decoder. Allowing the user to customize his sound right from their DCC handheld instead of having to reload the entire sound set using the Quantum Programmer. All library CV's are handled by CV 117. These are indexed CV's like the volume and stereo controls.

<u>Library</u>	<u>CV</u>	<u>CV117</u>	<u>CV49</u>	<u>CV50</u>	<u>Effect</u>
Whistle Index	117.0.1	1-33	0	1	Special See Table
Bell Index	117.8.1	1-17	8	1	Special See Table
Chuff Index	117.10.1	1-5	10	1	Special See Table
Air Pump Index	117.16.1	1-15	16	1	Special See Table
Steam Generator Index	117.26.1	1-5	26	1	Special See Table
Dynamic Brake Index	117.28.1	1-6	28	1	Special See Table
Alternate Whistle Index	117.40.1	1-30	40	1	Special See Table

The table on the next page shows what sounds are tied to what CV value

Continued on next page →

<u>117.0.1 Value</u>	<u>Whistle</u>	<u>117.8.1 Value</u>	<u>Bell</u>
1	Native Whistle	1	Native Bell
2	Lukenheimer 3 Chime	2	Steam Bell, Air, Slow 1
3	Sata Fe LFM 192 6 Chime	3	Steam Bell, Air, Mid 1
4	PRR 3 Chime	4	Steam Bell, hand pull, slow 1
5	NYC 6 Chime	5	Steam Bell, air, mid 2
6	PRR Banshee Single Chime	6	Steam Bell, air, mid 3
7	N&W Single Chime	7	Steam Bell, hand pull, slow 2
8	NH 3 Chime	8	Steam Bell, air, fast 1
9	PRR 3 Chime #2	9	Steam Bell, air, mid 4
10	D&RGW 4 Chime	10	Steam bell, air, fast 2
11	L&N 3 Chime	11	steam bell, air, fast 3
12	SP 3 Chime	12	steam bell, air, very fast 1
13	Santa Fe LFM 191 5 Chime	13	steam bell, air, slow 4
14	GC&ER 5 Chime	14	Steam Bell, hand pull, slow 4
15	SP 6 Chime	15	Steam bell, hand pull, very slow 1
16	Hancock 3 Chime	16	steam bell, air, slow 2
17	CN 4 Chime	17	steam bell, hand pull, slow 3
18	N&W Single Chime #2	<u>117.10.1 Value</u>	<u>Chuff</u>
19	LNER A4 3 Chime (British)	1	Native Chuff
20	NYC 5 Chime	2	Heavy Chuff 1
21	NYC 6 Chime #2	3	Heavy Chuff 2
22	SAR AD60 Whistle	4	Medium Chuff
23	Peanut Single Chime	5	Light Chuff
24	B&O Single Chime	<u>117.16.1 Value</u>	<u>Pump</u>
25	Nathan 5 Chime	1	Native Pump
26	PRR Banshee Single Chime #2	2	Compound - Small 2
27	NSW C35 Class	3	Compound - Small 3
28	NSW C38 Class	4	Compound - Med 3
29	Hancock 4700 Air	5	Compound - Large 1
30	Hancock 4710 Air	6	Compound - Large 2
31	Hancock 3 Chime Air	7	Single - Small 1
32	Unknown Single Chime	8	Compound - Med 1
33	WABCO E1 (horn)	9	Compound - Med 2
<u>117.26.1 Value</u>	<u>Steam Generator</u>	10	Compound - Small 4
1	Native Steam Generator	11	Compound - Large 3
2	Large Generator	12	Compound - Large 4
3	Cass - Long	13	Single - Large 1
4	Cass - Short	14	Compound - Small 1
5	Small Generator	15	Compound- Atmosphere Vented

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 Whistle On or Off (also toggles alternate Whistle after triggered using F11)

F3: Plays Coupler sounds.

F4: Toggles Blower Hiss On or Off

F5: No effect in Neutral, while moving toggles a "drift" function. Chuff sound will drop in volume and rod clank sounds will increase. Drift is speed dependent, they 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 and any partial shutdown state. If your loco is making sound but not moving try pressing F6 twice. When moving in forward or reverse triggers the Doppler effects causing the 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 zero and while the loco is coasting, push F7 to *actually engage the brakes!* This is far more realistic than any other decoder based braking methods because an engineer would never engage the brakes with the throttle open at main line speed. (Deceleration momentum required)

F8: Mute.

F9: In neutral puts loco in disconnect/standby/shutdown modes. Press F9 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 F9 4x for standby, the loco will no longer respond sound wise to any throttle input. Press F9 6x for full shutdown. This will take the locomotive through a series of procedures and you will hear loco shut all the way down, followed by the engineer closing some hatches and turning off the lights before finally the cab door bangs shut to show 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 Whistle hoot once. As you throttle up the loco will sound as though it's under a very heavy load. Concisely, if you throttle down you'll hear the motor drop down like it's coasting. Neither of these operations will affect speed until **F9** is pressed again when you will hear a double Whistle hoot indicating that Sound Of Power has been turned off.

F10: Status Report. This is a very helpful troubleshooting tool. If your loco is starting up and making sounds but not responding to throttle input, push F10 in neutral, the loco will speak out the programmed address, followed by either "Disconnect", "Standby" or "Shutdown". If it reports any of these states press F2 twice to revive it. It may also say "Consist" in this case the locomotive has been programmed into Consist mode, to defeat this program CV19 to a value of 0.

When moving, **F10** acts as a speedometer giving a verbal read back of the scale miles per hour.

F11: Toggles between the primary and secondary Whistle. After pressing **F11** once **F2** will control the secondary Whistle 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 Whistle sequence

F16-25: Reserved for user assignment

F26: Fuel Loading Scenario

F27: Maintenance Scenario

F28: In Neutral plays Water Loading Scenario, while moving plays the sound of a water scoop.

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@QSIolutions.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.QSIolutions.com for complete warranty information.



Diesel Titan Q2-FX Programming Guide.
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