

Quantum Engineer™ Add-on Control System



**For Analog Operation of
Special¹ Quantum System™
Equipped Locomotives**

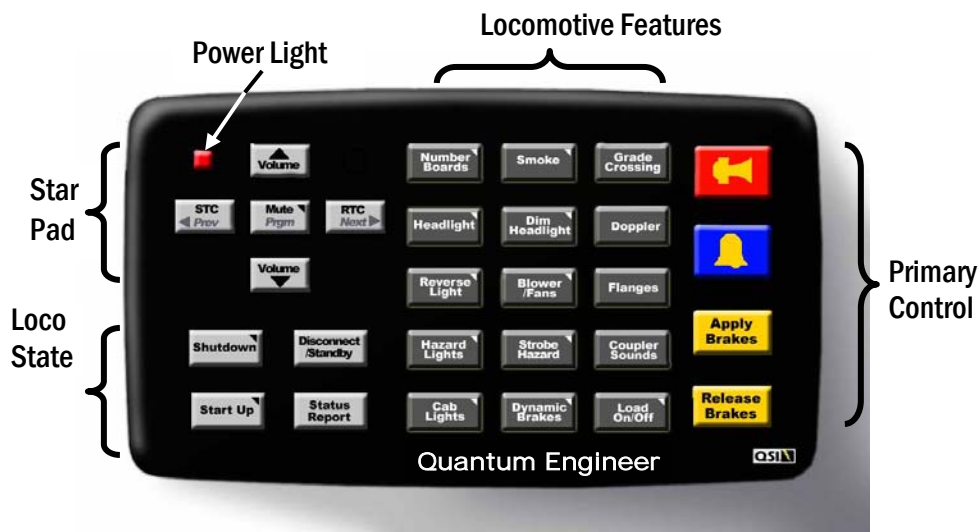
¹ Only applies to Quantum Systems equipped with QARC Analog Technology.

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Quantum Engineer™ Operating Instructions

Quantum Engineer Controllers are designed to easily and quickly operate locomotive features that have QARC (Quantum Analog Remote Control) technology. Except for simple horn and bell operations, the Quantum Engineer Control is not suitable for older Quantum locomotives that do not include QARC technology (see your locomotive Operation Manual).



Introduction

The Quantum Engineer buttons are organized by function to make operation simpler. The buttons on the right are the **Primary Control Keys** for locomotive operation and include horn, bell and brakes.

The set of fifteen gray keys to the left of the Primary Control Keys, are the **Locomotive Feature Keys**, and provide operation of different locomotive settings such as lights and fans, as well as controlling different effects like Doppler and Flange sounds.

The cluster of five keys in a star pattern in the upper left corner are used for two different types of control. During operation, the vertical arrow keys control sound volume, and the left/right arrow keys select the throttle mode. During programming, the arrow keys select

the different program options and allow you to change the settings. This group of five keys is called the **Star Pad Keys**.

The keys in the lower left are used to control the locomotive states of Start Up, Shut Down, Disconnect and Standby as well as locomotive Status reporting. This group is called the **Locomotive State Keys**.

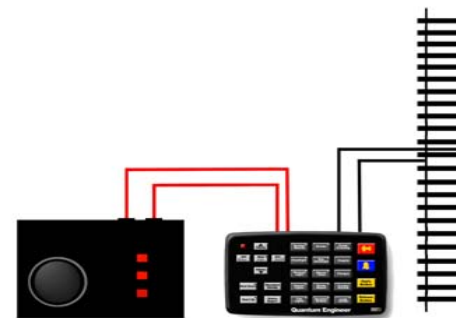
Note: Some keys have a small triangle in the upper right corner. These keys turn on or off the indicated feature using a special technique: pressing these keys once will turn the feature on while pressing it twice in quick succession (double-pressing)² will turn the feature off. This allows you to know whether you have turned a feature on or off without having to see or hear the locomotive³.

Installation

Wire the Quantum Engineer to your power pack's variable DC output and to the track as shown in the diagram below. The red wires connect to the power pack's variable DC output (throttle) and the black wires connect to the track.

- Remove the backing from the loop side (fuzzy side) of the Velcro tape and press it to the bottom of the Quantum Engineer. Remove backing from the hook side of the Velcro tape and attach it to your power pack or to a convenient place in your control area.

The unit will be in **Run Mode**⁴ as soon as power is applied. In **Run Mode** the Bell and Horn buttons will operate normally, and the red LED will shine steadily. Your unit is ready to operate.



² Like double-clicking a mouse button on your computer.

³ The only exceptions are the Start Up and Shut Down keys where a double press produces an extended Start Up or Shut Down sound effect.

⁴ Quantum Engineer has two modes, Run and Programming. See Programming on Page 19.

Operation in Run Mode

If Quantum Engineer has been installed correctly, the red Power Light will glow steadily when the throttle is turned up.

The following is a list and explanation of the features for the four different key groups.

Primary Operation Keys



Pressing the **Horn** key will produce Horn or Whistle blasts as long as the button is pressed. If you press and release it quickly, you will get a short “Hoot” sound.

Note: Some Quantum locomotives have special Horn Endings that can be triggered by releasing the **Horn** key and then quickly pressing and releasing⁵ or tapping the **Horn** key before the Horn or Whistle sound quits⁶. This special effect can also be performed by releasing the **Horn** key and quickly pressing the **Bell** key.



Pressing and releasing the **Bell** key will toggle the locomotive’s bell effect on or off.

Apply Brakes and

Release Brakes You can apply brake effects with the **Apply Brake** button in RTC (Regulated Throttle Control) or STC (Standard Throttle Control)⁷ although RTC provides more realistic control⁸.

- Without reducing the track voltage, press and hold the **Apply Brakes** key. Hear air being released from the train brake pipes continually. The longer the air is released the greater the braking action. Diesel motor

⁵ Do not confuse this with a Doppler action, which is triggered by quickly releasing and pressing the horn key during horn operation.

⁶ See your locomotive’s Operation Manual for additional information on Doppler and special Horn Endings.

⁷ A Load value greater than “0” must be programmed in Program Option 2 and the Load must be activated using the Load On/Off key in order for the Apply Brake key to have any affect in STC. RTC does not require a Load value for the braking features to operate.

⁸ See description of RTC and STC in the Quantum Operation Manual supplied with your locomotive.

sounds will automatically reduce to idle and steam chuffing will reduce to its lowest Sound of Power™ setting.

- Let go of the **Apply Brakes** key to stop the air release. The train will continue to slow at the last braking value.

Note: If you initially press the **Apply Brakes** key only briefly, you will hear no air release sound and the locomotive will coast to a stop at its Intrinsic Inertia⁹ and Load setting without any braking applied.

- If you want to apply more braking, press and hold the **Apply Brakes** key to release more air. When you reach the desired amount of braking, let go of the **Apply Brakes** key to stop the air release.
- Press the **Release Brakes** key to release the brakes to return the locomotive to coasting.
- Press the **Release Brakes** key a second time and hear the Diesel Motor or Steam Chuff return to its pre-braking throttle setting. The locomotive will accelerate back to its original speed at a rate proportional at its Intrinsic Inertia and Load setting.

Note: Apply Brakes will have no affect in STC unless the locomotive has an active Load value (see Load On/Off on page 7).

Note: You will only need to press the apply brakes key once after the locomotive has stopped to return to original speed¹⁰.

Note: If the locomotive is in Neutral when the **Apply Brakes** key is pressed, a Long Air Let-off sound simulates setting the brakes. However, no braking effect is activated¹¹.

Note: If you apply brakes at a high throttle setting, the locomotive will often come to a much smoother stop than simply lowering the throttle.

Note: When a locomotive is stopped with brakes, it will not enter Neutral until the throttle is reduced below V-Start.

Note: We recommend using the brakes to stop a consist rather than the throttle. After the consist has stopped, lowering the throttle below V-Start¹² will ensure that all locomotives enter Neutral at the same time, making it more likely that the consist can be reversed reliably.

⁹ RTC has Intrinsic Inertia; STC does not. Load value is set in POP 2.

¹⁰ This applies to Q1a software released after July 2006. Q1 and early Q1a will require two Brake Releases to return to original speed.

¹¹ If the brakes are set in Neutral, turning up the throttle automatically releases the brakes.

¹² See the Analog section of your *Quantum Operation Manual* for an explanation of V-Start and entering and leaving Neutral.

Locomotive Feature Keys

Load On/Off

Once you enter the Load value into Programming Option #2 (POP 2) and return to Run Mode, you can toggle this Load value on or off in Neutral with the **Load On/Off** key. When Load is off, the locomotive will accelerate or decelerate at its Intrinsic Inertia value.

Operation while in Neutral

- Press the **Load On/Off** button once in Neutral to turn on the Load. You will hear a Long Air Let-off.
- Double-press the **Load On/Off** button in Neutral to turn off the Load. You will hear a coupler clink.

Note: Labored sounds (Sound-of-Power™) are increased when Load is on and the locomotive is accelerating.

Operation while Moving

With RTC¹³ selected and the locomotive is moving in Forward or Reverse, pressing the **Load On/Off** button will apply or remove a “Heavy Load” to the locomotive. This represents a train that would take over ten to fifteen minutes to accelerate to full speed or to coast to a complete stop. You can apply “Heavy Load” as soon as you start moving or wait until you are up to speed.

- Press the **Load On/Off** button once in Forward or Reverse to turn on Heavy Load. Hear a single Horn or Whistle hoot.
- Double-press the **Load On/Off** button in Forward or Reverse to turn off Heavy Load. Hear a double Horn or Whistle hoot.

Note: Heavy Load does not require you to program any Load values in POP 2.

Note: If you apply Air Brakes while in Heavy Load, the locomotive will return to operation using the programmed Load setting in POP 2.

Note: Be aware that once Heavy Load is turned on, the throttle will have little effect in changing the speed of the train. If you turn the throttle up, you will hear very intense Sound of Power effects or if you turn the throttle down, you will hear very subdued Sound of Power¹⁴. You can use

¹³ Load On/Off has no effect under STC.

¹⁴ If you turn the throttle down too far, the train will slow quickly as the available power to the track falls below the level that is necessary for RTC to operate.

this feature to create heavy labored sounds while climbing a grade or reduced labored sounds while descending a grade with very little change in the speed of the train.

Dynamic Brakes

Many prototype diesel locomotives have dynamic brakes that cause the train to slow down by using the traction motors in generator mode. This helps dissipate the energy of a moving train by converting it to electrical power, which is then applied to a large air-cooled resistor load in the locomotive.

- While the locomotive is operating at a steady speed, press the **Dynamic Brakes** key once to turn on the Dynamic Brakes. Hear the Diesel Motor reduce to notch 1 followed by the sound of the powerful diesel Cooling Fan starting up.
- Double-press the **Dynamic Brakes** key to turn off the Dynamic Brakes. Hear the Dynamic Brake Cooling Fan shut off while the Diesel Motor returns to its original notch and Sound-of-Power setting.

Note: If the **Dynamic Brakes** key is pressed for a steam loco, the Chuffing will reduce to a low level and return to its previous setting when Dynamic Brakes are shut off. This makes steam locomotive behavior similar¹⁵ to diesels in a consist.

Note: In contrast to Air Brakes (F7), Dynamic Brakes do not increase the deceleration rate specified by the Load setting in POP 2. *The Dynamic Brakes are only a sound effect and have no actual braking action¹⁶.*

Note: The Dynamic Brake function automatically turns off when entering or leaving Neutral, or when the speed of the locomotive drops below 7 smph¹⁷. The Dynamic Brakes cannot be turned on in Forward or Reverse unless the locomotive is traveling over 8 smph. Dynamic Brakes will not turn on if the locomotive is accelerating.

Note: Dynamic Brakes can be turned on in Neutral if the locomotive is in Disconnect (see note under **Locomotive State Keys**, page 15).

¹⁵ It would be unrealistic for a steam locomotive to be working at full Sound-of-Power while Dynamic Brakes are being applied to other locomotives within the same consist.

¹⁶ Prototype dynamic brakes are commonly used on down grades with the intention of maintaining a constant speed rather than stopping the train.

¹⁷ Dynamic Brakes on prototype diesel locomotives are seldom used at low speeds where they are less effective.

Grade Crossing

Prototype railroads use horn or whistle codes of long and short blasts for communication or warning signals. One of the most common is the code of two longs, a short and a long horn signal to warn of approaching a grade crossing. Although the Quantum operator can perform these signals with the **Horn** button, we have made it even more convenient.

- Press the **Grade Crossing** key once to trigger the grade crossing warning signal.
- If you press the **Horn** key during the Grade Crossing scenario, you will terminate this feature and take control of the Horn or Whistle.

Note: Grade Crossing feature does not operate in Neutral.

Doppler

You can trigger the Doppler effect by quickly interrupting the horn signal in the same way it is described in the Analog section of your Quantum Operation Manuals. Or you can use the **Doppler** Key dedicated to the Doppler effect.

- Start the Horn or Whistle by pressing the **Horn** key¹⁸ and hear the normal Horn or Whistle.
- While still pressing the **Horn** key, press and release the **Doppler** key to hear the Doppler shift. A few seconds after the **Horn** key is finally released the locomotive sounds return to normal¹⁹.

Flanges

Quantum provides automatic Squealing Brakes²⁰ sounds as a locomotive slows to a stop. The operator can also control Squealing sounds for continuous and variable brake sounds for protracted stops or to simulate the sounds of wheel Flanges on curved track.

- Pressing the **Flanges** key when the loco is moving at any speed will manually activate Squealing sounds, and repeated pressings while the Squealing sounds are occurring will continue the sounds uninterrupted.

Note: Flanges are a sound effect only and will not slow the locomotive.

¹⁸ If you do not turn on either Horn or Bell, the Doppler shift will still occur with the locomotive sounds, but will be less dramatic.

¹⁹ If the bell was on, it will shut off prior to all sounds returning to normal.

²⁰ Squealing Brakes come on automatically when the speed is reduced from high-speed travel (over 40 smph) to less than 20 smph.

- The **Flanges** key can also be used to arm steam Cylinder Cocks when the locomotive is in Neutral. This eliminates the need to wait for a full 25 seconds before the Cylinder Cocks arm.

Coupler Sounds

There are two ways to use the Coupler Sounds effect key.

- As your locomotive is about to couple up to a string of cars, press the **Coupler Sounds** key to trigger the Coupler Crash sound. Use the **Coupler Sounds** key again as the locomotive moves out to trigger the same sound as the slack is taken up in the cars²¹.
- Coupler Sounds have a different effect in Neutral. While stopped in Neutral in uncoupling position over an uncoupling magnet, press the **Coupler Sounds** key once to produce the sound of the lift bar and coupling pin being raised. This also Arms the uncoupling sound effect. Press the **Coupler Sounds** key again while pulling away from the cars (or remaining stationary in Neutral) to trigger the sound of the coupler knuckle opening and air-lines parting.

Smoke

Your locomotive may be equipped with an automatic Smoke Unit, which may control the smoke differently in each of the directional states.

- Press the **Smoke** key once to turn on the automatic Smoke Unit.
- Double-press the **Smoke** key to turn off the automatic Smoke Unit. The Smoke Unit will be off in all directional states.

Note: The Smoke Unit in your locomotive may be wired directly to the power pick-ups in which case it will not be controlled by QARC technology and pressing the Smoke button on the Quantum Engineer will have no effect.

²¹ The locomotive must actually be moving in order for this effect to occur.

Automatic Features with “Take Control” Operation

Many of the features that can be turned on or off by Quantum Engineer already have Automatic Control. The Quantum System allows the operator to “Take Control” of certain automatic features by using their associated control keys. Once you “Take Control”, the features will no longer have Automatic Control and you will control their operation and state with their key commands. Automatic and Take Control operations are described in the table below.

Quantum “Take Control” Operation

	Automatic Operation			Take Control	
	Forward	Reverse	Neutral	Key	Operation
Steam Blower Hiss	Off after 10 seconds	Off after 10 seconds	On after 10 seconds	Blower/Fans	Turns the Blower hiss sounds on or off.
Diesel Vents & Cooling Fans	Non-operating	Non-operating	On and off at random times	Blower/Fans	Turns the Cooling Fans on or off.
Number Board Lights	On	On	On	Number Boards	Turns the Number Board Lights on or off.
Headlight	On	Dim	Dim	Headlight and Dim Headlight	Headlight key turns Headlight on or off. Dim Headlight key will dim or brighten an On Headlight.
Reverse Light	Off	On	Off	Reverse Light	Turns the Reverse Light on or off.
Hazard Lights	Pulsing	Dim	Dim	Hazard Lights and Strobe Hazard	Hazard Light key turns Hazard Lights on or off. Strobe Hazard key selects Hazard light to pulse or become dim.
Cab Lights	Off after 10 secs.	Off after 10 secs.	On after 10 secs.	Cab Lights	Turns the Cab Lights on or off.
Steam Cocks	If armed, plays 11 times, or until loco exceeds 8 smph.	If armed, plays 11 times, or until loco exceeds 8 smph.	Auto Arms after 25 seconds.	Flanges or Start Up key In Neutral	Immediately arms steam Cylinder Cocks in Neutral.

Automatic operation is restored if the power is shut down and reapplied or if the **Start Up** key is pressed in Neutral (see the description of Start Up on the following pages).

Note: If your locomotive has an optional Hazard Light, the Headlight may not be dimmable.

The following are all Take Control features that can be operated by the different Quantum Engineer keys.

Number Board Lights This key turns the Number Board lights on or off on specially equipped diesels.

- Press the **Number Boards** key once to turn on and take control of the Number Board Lights.
- Double-press the **Number Boards** key to turn off and take control of the Number Board Lights.

Headlight

- Press the **Headlight** key once to turn on and take control of the Headlight. The Headlight will be on in all directional states.
- Double-press the **Headlight** key to turn off and take control of the Headlight. The Headlight will be off in all directional states.

Dim Headlight

- Press the **Dim Headlight** key once to dim the Headlight and Take Control of the Directional Headlight brightness.
- Double-press the **Dim Headlight** key to brighten the Headlight and take control of the Headlight.

Note: If the Headlight has been turned off with the **Headlight** key, the **Dim Headlight** key will not have a noticeable effect. However, if the Headlight is turned on at a later time, it will come on with the dim setting set by the **Dim Headlight** key.

Reverse Light

- Press the **Reverse Light** key once to turn on the Reverse Light and Take Control of the Reverse Light. The **Reverse Light** will be on in all directional states.
- Double-press the **Reverse Light** key to turn off and take control of the Reverse Light. The Reverse Light will be off in all directional states.

Hazard Lights

Hazard Lights can be a Mars Light, Over-Head Blinking Lights, or Ditch Lights.

- Press the **Hazard Lights** key once to turn on and take control of the Hazard Lights. The Hazard Light will be on in all directional states.
- Double-press the **Hazard Lights** key to turn off and take control of the Hazard Lights. The Hazard Lights will be off in all directional states.

Note: Mars Light and Ditch Lights are part of the automatic lighting system. Overhead Blinking Lights are on in all directional states.

Strobe Hazard

Hazard Lights can either be steadily-on or strobing. The Mars Light strobe gives the effect of a moving beam of light, the Over-Head Light strobe is a steady repetitive blinking, and Ditch Lights strobe blinks back and forth between the right and left lights.

- Press the **Strobe Hazard** key once to turn on the strobe effect and take control of the Hazard Lights.
- Double-press the **Strobe Hazard** key to turn off the strobe effect and take control of the Hazard Lights.

Note: If Hazard Lights have been turned off with the **Hazard Lights** key, the **Strobe Hazard** key will not have a noticeable effect. However, if the Hazard Lights are turned on at a later time, they will come on at the strobe setting set by the **Strobe Hazard** key.

Cab Lights

This key turns the Cab Lights on or off on specially equipped locomotives.

- Press the **Cab Lights** key once to turn on and take control of the Cab Lights.

- Double press the **Cab Lights** key to turn off and take control of the Cab Lights.

Blower/Fans

This key turns the steam Blower or diesel Cooling Fans on or off.

- Press the **Blower/Fans** key once to turn on and take control of Blower or Cooling Fans operation.
- Double press the **Blower/Fans** key to turn off and take control of Blower or Cooling Fans operation.

Locomotive State Keys

Disconnect/Standby

Disconnect will disable the locomotive's electric motor drive circuit to allow the throttle to be changed without the locomotive moving. In Disconnect, the operator can increase the throttle on a stationary locomotive to rev the Diesel Motor or vent steam in a steam locomotive.

Standby places the locomotive in a special idle state with subdued sounds where it will not respond to throttle or most of the feature keys²². Standby is ideal for leaving some locomotives running on a siding while you operate other locomotives.

- Press the **Disconnect/Standby** key once in Neutral to enter Disconnect.
- To leave Disconnect:
 - Press the **Start Up** key to regain normal operation.
 - Or press the **Disconnect/Standby** key again to enter Standby.
 - Or press the **Shut Down** key to enter Total Shut Down.
- To leave Standby:
 - Press the Start Up key to enter normal operation.
 - Or press the Shut Down key to enter Total Shut Down.

Note: You can turn on diesel Dynamic Brakes in Disconnect to create Sound-of-Power as the throttle is moved up and down. Engineers on prototype diesels use the dynamic brakes to load the diesel motor-

²² The four exceptions are the F6 Start Up key, the Mute Key, the Shut Down key and the Status Key.

generator to test its output and efficiency while the locomotive remains stationary.

Note: If power is turned off during either the Disconnect or Standby procedures, the locomotive will remember the last command and will power up in the same stage. If Start Up is initiated during any of the above procedures, the locomotive will immediately return to normal operation.

Note: Neither the **Hom** nor the **Bell** key will operate in Standby or Shut Down. Analog Programming is disabled in Disconnect and Standby.

Shut Down

Shut Down allows the operator to take the locomotive “off line” (turn off sounds, lights, ignore throttle settings and feature commands²³) independent of the operating session; that is, the locomotive will still be “off line” when power is reapplied for the next operating session.

- Press the **Shut Down** key once to produce a Rapid Shut Down. Rapid Shut Down will shut the locomotive off in a few seconds.
- Double press the **Shut Down** key to produce an Extended Shut Down scenario. Extended Shut Down will shut the locomotive down over thirty seconds with progressive sound and light effects. The Extended Shut Down for diesels and steam are as follows:

Diesel Extended Shut Down: After double pressing the **Shut Down** key, hear a Long Air Let-off, followed by Directional Lighting turning off (if on). In a few seconds, the Air Pumps shut off, followed by the Number Boards and the sounds of the Cooling Fans shutting off, the louvers closing, the Diesel Motor shutting down and finally, the Cab Lights shutting off. After a short time, you will hear the engineer’s door open and then shut.

Steam Extended Shut Down: After double pressing the **Shut Down** key, you will hear a Long Air Let-off, followed by Directional lighting turning off (if on). In a few seconds, the Air Pumps will turn off, followed by the sounds of Pop Off operating for about ten seconds followed by a hiss sound that gradually trails off to silence.

- To leave the Shut Down state, press the **Start Up** key.

Note: If power is turned off during a Shut Down procedure, the locomotive will be in Shut Down when power is reapplied. If the **Start Up** key is pressed during a Shut Down procedure, Shut Down is aborted and the locomotive returns to normal operation.

Note: Except for a few extra sound effects for Extended Shut Down, the shutting down of lighting and sound effects still occur during Rapid Shut Down but happen more quickly.

Note: You cannot shut down an locomotive while it is moving. There is no response if you press the **Shut Down** key in Forward or Reverse.

Note: All locomotives on the same powered track will go into Shut Down when you press the **Shut Down** key.

Start Up

If your locomotive is in Disconnect, Standby or Shut Down, you can return your locomotive to normal operation by pressing the **Start Up** key.

Start Up will be different for each stage of Shut Down, but all will start up with a Long Air Let-off and will enter normal operation.

- **Start Up from Disconnect:** Press the **Start Up** key in Disconnect and the locomotive will produce a Long Air Let-off then enter normal operation.
- **Start Up from Standby:** If you double press the **Start Up** key in Standby, the locomotive will produce a Long Air Let-off, the Directional Lighting will turn on and then the locomotive will enter normal operation.
- **Start Up from Shut Down:**
 - Press the **Start Up** key once to produce Rapid Start Up.
 - Double press the **Start Up** key to produce an Extended Start Up scenario. The Extended Start Up for diesels and steam are as follows:

Diesel Extended Start Up: If you double press the **Start Up** key, the diesel locomotive will produce a Long Air Let-off. After a few seconds, you will hear the engineer’s door opening and closing, followed by lighting turning on and vents opening, the Diesel Motor starting up, the Air Pumps starting up, and the locomotive entering normal operation.

Steam Extended Start Up: If you double press the **Start Up** key in Shut Down, the steam locomotive will produce a Long Air Let-off, the Dynamo will rev up and the Directional Lighting will turn on, followed by the Air Pumps starting up, the steam Blower turning on, the Cylinder Cocks arming, and then the locomotive will enter normal operation.

²³ The two exceptions are the Start Up Key and the Status Key.

Note: If your locomotive has been Deselected and Shut Down using a Magnetic Wand, it must first be selected by pressing the **Start Up** key for 3 seconds followed by again pressing the **Start Up** key to start the locomotive.

Note: Whenever a Start Up command is sent to a selected locomotive, regardless of whether the locomotive is in Shut Down or operating normally, the Quantum System will automatically restore all Automatic Controls and re-arm Cylinder Cocks on steam locomotives.

Status Report Quantum provides verbal information about the locomotive's current operating state when the locomotive is stopped or the locomotive's current speed in scale miles per hour when moving.

- Press the **Status** key when locomotive is stopped in Neutral. If the locomotive is in Disconnect /Standby /Shut Down it will say so. Otherwise the locomotive's Helper type (if not Normal) will be announced, followed by Load level, Load on/off status (if Load not equal to zero), and type of Throttle Mode (Regulated or Standard).
- Press the **Status** key while locomotive is moving. The locomotive will verbally report its speed in scale miles per hour.

Note: When Status Report is activated, the locomotive's sounds will reduce to one half their current volume settings during the verbal report and then return to normal volume when the report has ended.

Star Pad Keys During Normal Operation

Volume ▲ and

Volume ▼ Locomotive System Volume can be changed²⁴ anytime the locomotive is operating (except in Shut Down).

- Press the **Volume** ▲ key to increase the System Volume level.
- Press the **Volume** ▼ key to decrease the System Volume level.

Each time either **Volume** key is pressed and released, the volume changes by 2 db. Or press and hold either **Volume** key to automatically step up or down through the volume levels one by one; release the key when the desired volume is reached.

Note: System Volume cannot be changed while an locomotive is in Shut Down.

Mute The Quantum System allows you to reduce the System Volume to a lower level or increase it back to its original setting using the **Mute** key. This is useful when you need to lower the sound to engage in a conversation or to answer the phone. The Mute feature changes the sound gradually over a second or two²⁵.

- Press the **Mute** key once to gradually reduce the volume to the Mute level.
- Double press the **Mute** key to gradually restore the locomotive sounds to its normal level.

Note: Mute state is not maintained if power is turned off and back on; the locomotive will return to full System Volume setting.

²⁴ If your locomotive is equipped with Magnetic Wand option, the System Volume can also be increased or decreased, using the wand, in any state. See your Quantum Operation Manual.

²⁵ **Mute** can be useful during operation by lowering the volume realistically as the locomotive moves to the background of the layout and increasing the volume realistically as the locomotive moves to the foreground.

STC and

RTC Use these keys in Neutral to select Throttle Mode. Quantum has two types of throttle control as described in the Quantum Operation Manuals that came with your locomotive. Regulated Throttle Control (RTC) has motor control capability that allows the locomotive to behave as though it has massive inertia. Locomotives under Standard Throttle Control (STC) respond quickly to changes in throttle or loading. The default is RTC.

- Press the **STC** key to select Standard Throttle Control.
- Press the **RTC** key to select Regulated Throttle Control.

Regulated Throttle is preferred under normal operation. However, STC is preferred when putting locomotives away or when uncoupling.

Programming with Star Pad Keys

The Quantum Engineer Controller makes Analog programming of your Quantum locomotive with QARC technology very simple. All programming is done using the Star Pad keys. Programming Mode functions are shown in gray *italics* while Run Mode functions are shown in normal type.

Entering Program Mode

Prgm Press and hold the *Prgm* key prior to turning up the throttle to where the locomotive sounds come on. Continue to hold the *Prgm* button until you hear “Enter Programming”. The locomotive will then respond with “Option One – System Volume”.

Note: You cannot use the *Prgm* key to enter Programming Mode on earlier Quantum locomotives that do not have QARC technology.

Note: Once you have entered Programming Mode, the *Prgm* key has no effect.

Note: When in Programming Mode, the red power light on the Quantum Engineer blinks on and off.

Note: In Programming Mode, the locomotive’s Directional Lighting alternately blinks between the Headlight and the Reverse Light.

Scrolling through the Program Options

Next and

Prev Use the *Next* and *Prev* keys on the Star Pad to move easily through the Program Options (POP’s). The Program Option numbers and names are listed in a table in your Quantum Locomotive Operation Manual under Analog Programming.

- Press the *Next* key once to move to the next POP. The locomotive will announce the next POP number and name. Or press and hold the *Next* key to automatically step up through the POP’s one by one and then release the key when the desired POP is reached. The locomotive will verbally count up through each POP number while the key is pressed and then will announce the POP name when the *Next* key is released.
- Press the *Prev* key once to move to the previous POP. The locomotive will announce the previous POP number and name. Or press and hold the *Prev* key to automatically step backwards through the POP’s one by one and then release the key when the desired POP is reached. The locomotive will verbally count down through each POP number while the key is pressed and then will announce the POP name when the *Prev* key is released.

Entering a Program Option and Making Changes

Volume ▲ and

Volume ▼ The **Up Volume** and **Down Volume** level keys can be used to enter and change POP values.

- Press either the **Volume** ▲ or **Volume** ▼ key once to enter the POP. Entering a POP does not make any changes. The locomotive will announce the current setting for that option. For any volume option, hear “Volume equals X” (where “X” is its current volume level setting). After a moment, you will hear the sound playing at its current volume²⁶.
- After the announcement of the current value, press the **Volume** ▲ or the **Volume** ▼ key to increase or decrease the option setting by one

²⁶ Setting any individual sound volume level in Analog will also apply to DCC and vice-versa.

level. Or press and hold the **Volume ▲** or **Volume ▼** key to automatically step up or down through the level settings one by one and then release the key when the desired level is reached.

Note: Most POP's require an increase or decrease in some level setting. For instance, many POP's are used to increase or decrease volume levels of the different sound effects while POP 2 is used to increase or decrease the Load setting.

For volume settings, **Volume ▲** will increase the volume level and **Volume ▼** will decrease the volume level. Volume will change by 2 db for each level change. These two buttons also increase or decrease the Load level in POP 2. For POP's with level settings, you will hear the level value spoken out.

For other POP's, the **Volume ▲** and **Volume ▼** keys scroll through the possible settings.

Some POP's simply go through an ordered procedure such as V-Start, V-Max, Reset, and About. These POP's do not distinguish between the **Volume ▲** and **Volume ▼** keys. These POP's will advance through their procedures one step at a time when either the **Volume ▲** or **Volume ▼** key is pressed.

Note: Press the *Next* or the *Prev* keys any time to move to the next or previous POP. Or press and hold the *Next* or the *Prev* keys to automatically step through the POP's.

Leaving Programming

- Exit Program Mode anytime you want by turning the track power off and back on again.

Note: You can leave Programming anytime you want, regardless of which part of Programming you are in. If you have made a change, that change will be retained when you exit.

Trouble Shooting

My Loco does not respond to any or some Quantum Engineer keys.	Your locomotive may not have Quantum Analog Remote Control (QARC) technology. Or you may have shut your locomotive down with the Shut Down key or Magnetic Wand. If so, press the Start Up key. Or you may have forgotten that a double press turns off some features and a single press turns them on. Or some features may not be included in your model.
My locomotive is completely dead. No sounds, not even an air release when power is first applied.	Try resetting the loco with its jumper or magnetic wand (see your Quantum Operation Manual). Or, if your locomotive was being operated in DCC and power was suddenly removed while moving, the loco may still be waiting for a DCC signal. Place the locomotive on DCC track, activate, stop loco and turn off power. You may have pickup problems in your loco or an area of dead track.
My loco makes sounds but will not respond to the throttle.	You may have applied brakes to stop your locomotive. Either reduce the throttle below V-Start or press the Release Brake key two times. Or your locomotive is in Disconnect or Standby. Press the Start Up key.
I cannot get my locomotives to program.	Older Quantum locomotives cannot be programmed using the Quantum Engineer Program keys. Or you may not be holding the <i>Prgm</i> key down before turning on the power, Or you may not be holding it down long enough after turning on the power.
Pressing the Apply Brake key does not seem to have much affect at high speeds.	Set V-Max to a higher value (about 85% of full throttle voltage). Or you are in STC and no Load is turned on.
Sometimes in Neutral, Horn or Bell keys have no affect.	When entering Neutral, you must wait for the long air release before the Horn and Bell buttons will operate.
My Quantum Engineer will not send commands when keys are pressed. I do not hear any clicking sounds like I normally do.	Turn power off and back on again to reset the Quantum Engineer to normal operation.

When I press the Apply Brake key, the locomotive will not slow down for a long time and then when it does, it stops suddenly.	If you press the Apply Brake once briefly, the locomotive will enter coasting and slowly decelerate to a stop. However, if you have set V-Max too low, it will take some time before the RTC algorithm applies an internal motor voltage below V-Max. The effect is to “hang” the locomotive at a constant high speed for some time before it starts to slow down. Some operators will apply more and more braking to slow the locomotive, which causes the locomotive to slow rapidly when the internal voltage drops below V-Max. To minimize this problem, set V-Max close to your maximum throttle position.
After I apply Air Brakes and the locomotive is stopped, changing the direction switch blows the Whistle/Horn instead of changing direction.	After stopping with the Air Brakes , you must turn the throttle down until you hear a Short Air Let-off to enter Neutral and then change direction with the direction switch. If you leave the throttle turned up above V-Start, you are not in Neutral.

Quantum Engineer Features

Quantum Engineer will operate the following features in locomotives equipped with Quantum Analog Remote Control (QARC) technology:

Horn	Grade Crossing Horn Signal
Bell	Smoke On/Off
Apply Air Brakes	Headlight On/Off & Dim
Release Air Brakes	Reverse Light On/Off
Loco Shut Down	Number Board Lights On/Off
Loco Start Up	Hazard Lights On/Off & Strobe
Standby Idle	Cab Lights On/Off
Flange Squeal	Blower or Fans On/Off
Squealing Brakes	Dynamic Brakes On/Off
Doppler Shift	Motor Disconnect
Coupler Lift Bar and Pin	Mute
Coupler Opening Sounds	Verbal Speedometer Readout
Coupler Crash	Locomotive Status Report
Load On/Off	Easy Quantum Programming
Heavy Load On/Off	Prev & Next Program Stepping
System Volume in Run Mode	Steam Cylinder Cocks
Regulated (RTC) & Standard Throttle (STC) Selection	

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