Sturtevant Richmont®

Torque Measurement Systems

Torque Control Verifier

Instruction Manual

Revision 1.2

September 2002

Please Read and Understand Instructions
Before Attempting Installation

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Quick Start Guide:

Preface:
Each PTFM wrench uses a unique code that transmits every time the wrench reaches torque. This unique code allows multiple TCV & PTFM wrench sets to operate on the same frequency or "channel" without creating "cross talk" or false accepts on nearby TCVs. The key-switch is used to mate wrenches to the TCV. The TCV will ignore wrenches that it has not yet "learned". The TCV can learn up to four wrenches. If a fifth wrench is learned without first performing an "erase all", the TCV will randomly erase one of the other wrenches from memory.

It may help to think of the key-switch as a momentary or push-button switch since the key is never left in the program position for more than a couple seconds. In fact, if the key-switch is left in the program position for more than ten seconds, an "erase all" is performed.

Before learning a wrench, make sure the wrench and TCV are on the same channel. Clicking the wrench while watching the STRENGTH/PROG LED can verify this. If the LED turns green, they are both on the same channel. If the LED stays off, check the jumper settings on the wrench and the channel selection on the TCV (dead batteries also cause this problem). Note: Since the TCV filters out background RF noise; unlearned wrenches will cause the TCV to adjust the noise-level offset. You will see this occur when you check unlearned wrenches. The STRENGTH/PROG LED will shift from green to yellow to red to off. Likewise, the TCV will re-correct the offset when the unlearned wrench stops transmitting.

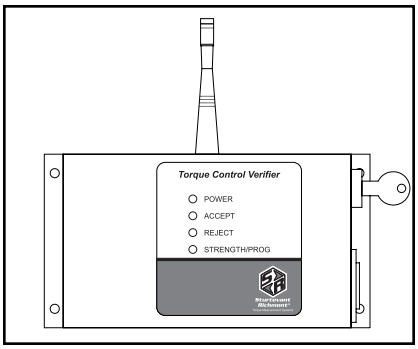
Learning:
To enter the "learn" mode, insert the key and rotate it clockwise to the program position. After two seconds the STRENGHT/PROG light will turn red. The POWER LED will also stop flashing and be on continuously. Turn the key back to the neutral position. The TCV will beep and all the LEDs will turn on to indicate that it is ready to learn a new wrench. Next, click the PTFM wrench once. The STRENGTH/PROG LED should turn yellow. After the LED turns yellow, click the PTFM wrench again. At this point the STRENGTH/PROG LED will flash green for four seconds and then go off.

In order to re-enter the normal operational mode, turn the key to the Program position then back to the neutral position and remove the key. The POWER LED will return to its normal cadence to indicate this return to the operational mode. To recapitulate:

1. Insert the key and rotate it clockwise - wait for the STRENGHT/PROG light to turn red.
2. Turn the key back to the neutral position.
3. Click the PTFM wrench twice.
4. Exit learning mode by turning the key clockwise and then back to neutral.

Erase All:
To erase all the wrenches from the TCV's memory, insert the key and rotate it clockwise to the program position. After two seconds, the STRENGHT/PROG light will turn red. The Power LED will also stop flashing and be on continuously. Leave the key in the program position until the STRENGHT/PROG LED turns back off (about ten seconds). Turn the key back to the neutral position, power the TCV down, and then power it back up.

Introduction:



Torque Control Verifier

The Sturtevant Richmont Torque Control Verifier (TCV) is used in conjunction with a PTFM wrench in order to provide a means of confirmation that a fastener has been installed correctly. Each time a PTFM wrench is used, an FM signal is transmitted. The TCV is designed to receive these transmissions and make decisions based upon their duration. If the TCV receives signals that satisfy its timers, an Accept signal will be generated. If the timers are violated, a reject will occur.

The TCV system operates in the 900MHz band and can be programmed to receive data on one of eight different channels. A data encryption scheme is utilized in order to eliminate cross talk between wrenches operating on the same frequency.

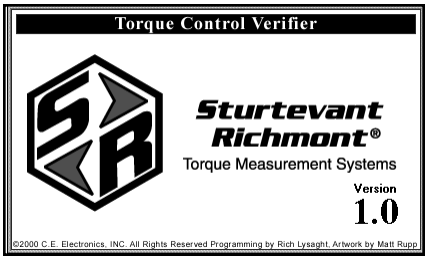
Four LEDs in the face of the unit provide visual feedback to operators. The LEDs indicate power, signal strength, programming modes, Accept and Reject statuses.

This unit may also be easily integrated into systems that utilize Programmable Logic Controllers (PLCs). The TCV will supply a digital indication to an external control when an accept or reject status occurs. PLCs can also tell the TCV when to drop these statuses through the use of the reset line.

Set-Up:

Icon

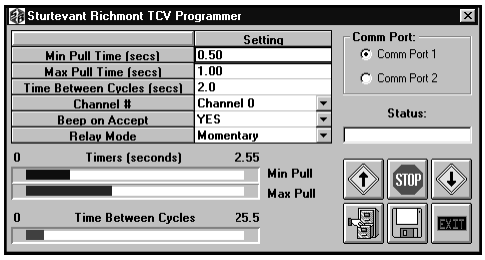
The TCV Programming Utility must be used in order to set-up a TCV unit. This utility will allow features such as minimum pull time, maximum pull time, time between cycles, frequency reception channel, accept beep, and relay mode all to be defined in a few easy steps.



Splash Screen

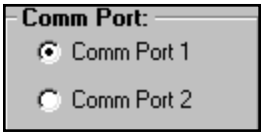
Running The Program:

In order to start the TCV Programming Utility running on a PC, either click on the CLK_TUNE item in the start menu or double-click on the CLK_TUNE icon. Once the program is started, a splash screen will appear momentarily. Following the splash screen, the main software window will appear.



TCV Programming Utility

Uploading TCV Settings:



The current settings can be read from the TCV unit by performing an upload. In order to perform an upload, be sure that the proper comm port is selected and that the null-modem cable is attached to both the PC and the TCV. After the TCV is attached to the PC via the null-modem cable, press the UPLOAD button. (This is the button that looks like a traffic sign with the arrow pointing up.) At this point, the software will try to communicate with the TCV. If communications are successful, data will be uploaded and the user will be prompted with the message "Parameter Transfer Complete".

If the transfer in unsuccessful the message "Unable to Communicate with TCV" will appear. If a problem occurs with the upload please refer to the trouble shooting portion of this document.

Minimum Pull Time:

The minimum pull timer defines the least amount of time that a PTFM torque signal can be asserted without being considered a reject. This value can be set anywhere from 0.00 to 2.55 seconds in 0.01 second increments.

Double-clicking on the minimum pull time value will allow the user to access and change this setting.

Maximum Pull Time:

The maximum pull timer defines the maximum amount of time that the PTFM torque signal can be asserted without being considered a reject. This value can be set anywhere from 0.00 to 2.55 seconds in 0.01 second increments.

Generally, this timer is used in order to prevent parts from being over-torqued. It is important that the maximum pull time is greater than the minimum pull time. The software will not allow a download to occur until this condition is satisfied.

The maximum pull timer is adjusted in the same manner as the minimum pull timer.

Time Between Cycles:

A third timer exists on the TCV. That timer defines the amount of time between cycles. If more than one signal is received within the time span defined by the time between cycles timer, only one Accept or Reject signal will be generated.

In some assembly scenarios, it is an accepted practice to tighten a fastener until the wrench clicks over and then to "hit" the fastener again for verification purposes. If this is the case, it is possible to set the time between cycles timer high enough to ignore the second "hit".

This timer can be set to any value from 0.0 to 25.5 seconds in 0.1 second increments.

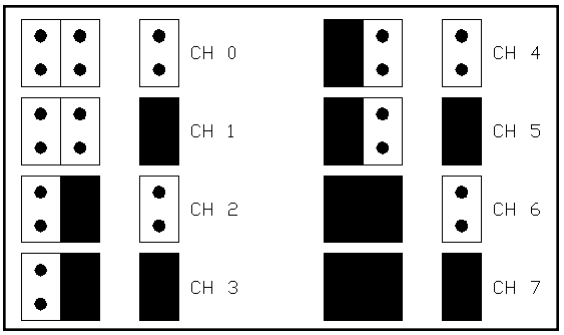
Channel Number:

The TCV can be programmed to operate on one of eight different frequencies in the 900MHz range. It is important to have the TCV operate on the same channel as the PTFM wrench(s) that it is mated with.

If several TCV units are used in close proximity to one another, it is helpful to program the TCV & wrench groups to different frequencies so that interference is minimized.

To select a channel for the TCV click on the arrow in the right hand side of the channel number parameter. A drop-down list will appear. From the list, select one of the eight channels.

In order for a PTFM wrench and TCV to work together, they both need to be operating on the same frequency. The chart to the right depicts channel setting vs. jumper placement inside the PTFM wrench.



PTFM Channel Selection

The colored in areas represent headers with a jumper attached. Boxes with two dots in their center represent headers without a jumper attached.

For example, if Channel 0 is to be selected, no jumpers should be attached. If Channel 7 is selected, all three headers should have jumpers attached.

Beep On Accept:

Every time a Reject occurs, the TCV will beep once. The TCV can also double-beep when an Accept occurs. Whether or not this "double beep" occurs is a user definable option. To set this property, access the Beep on Accept drop-down list and select either YES or NO.

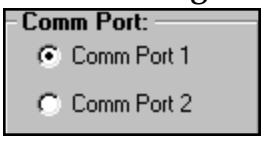
Relay Modes:

There are two relays inside the TCV. The Accept relay will be asserted each time an Accept condition occurs. Conversely, the Reject relay will fire every time there is a Reject condition.

These relays can be programmed to either be Momentary or Latching. If the relays are defined as Momentary, each time they are asserted they will close for 200 milli-seconds and then release. If the relays are set to Latching, each time a relay is asserted it will remain on until the beginning of the next cycle or until the Reset signal is asserted by some external means.

The Relay Mode can be set by selecting either Latching or Momentary from the Relay Mode drop-down menu.

Downloading:

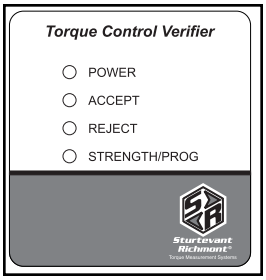


Once all of the programmable features for the TCV are set in the programming utility, these settings may be downloaded into the TCV. Before initiating a down-load, be sure that the appropriate comm port is selected and that the null-modem cable is attached to both the PC and to the TCV.

In order to start the download, press the Download button. (This button looks like a traffic sign with the arrow pointing down. If the data is transmitted without any problems, the software will give the user a message stating, "Parameter Transfer Complete".

If a problem occurs with the download, the software will warn the user with the message, "Unable to Communicate with TCV". If this message is reported please refer to the trouble shooting guide.

"Teaching" the TCV:

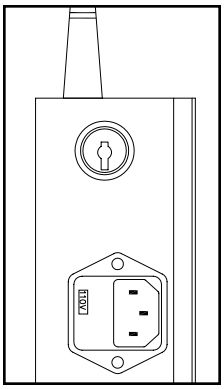


TCV Display

Each PTFM wrench has a unique code which it transmits every time the wrench reaches torque. This code changes every time the wrench is used. This features allows the TCV & PTFM sets to operate on the same frequency without creating "cross-talk" or false triggers.

The final step in the programming phase is to "teach" the TCV the rolling code that the PTFM wrench will generate. Once the TCV learns the wrench's seed code it will know how to roll to the next code along with the PTFM wrench.

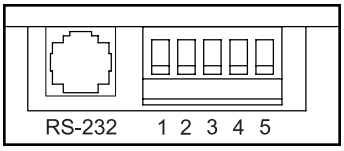
To enter the "learn" mode insert the key and rotate it to the program position (perpendicular to the antennae). After two seconds the Strength/Program light will come on and turn red. The Power LED will also stop flashing and be on continuously. Turn the key back to the neutral position (parrallel with the antennae), and then click the PTFM wrench once. The Strength/Program LED should turn yellow. After the LED turns yellow, click the PTFM wrench again. At this point the Strength/Program LED will flash green for four seconds and then go off.



Key-Switch in "Neutral" position.

In order to re-enter the normal operational mode, turn the key to the Program position then back to the Neutral position and remove the key. The Power LED will return to its normal cadence to indicate this return to the operational mode.

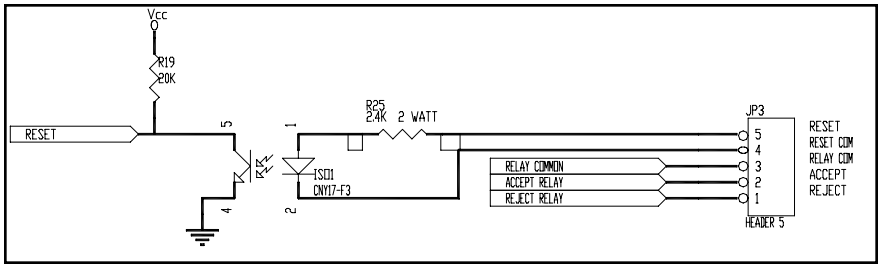
Using the I/O:

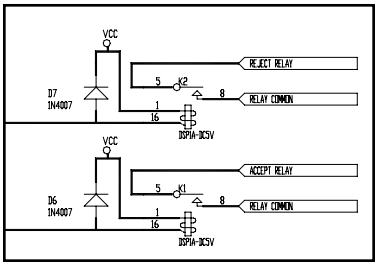


TCV I/O

The TCV has two relays and an optically isolated input. The relays allow the TCV to inform external controls about Accept and Reject statuses. The optically isolated input allows external controls to tell the TCV to "drop" its current state.

All of the I/O mentioned above is accessible on the five-pin Phoenix style pluggable connector. Pin 1 on the connector is the pin closest to the RS-232 port. The I/O structure is as follows:





I/O STRUCTURE

PIN 1	REJECT RELAY
PIN 2	ACCEPT RELAY
PIN 3	RELAY COMMON
PIN 4	RESET COMMON
PIN 5	RESET INPUT

I/O PIN-OUT

To make use of the relays, a voltage needs to be placed on PIN 3, the Relay Common. Then, if an Accept occurs the voltage placed on PIN 3 will be returned on PIN 2. If a Reject occurs, the voltage is returned on PIN 1.

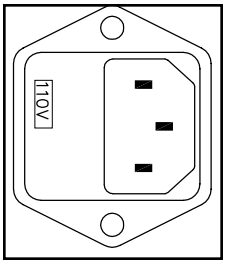
Both relays are normally open. Their contacts will close when they are asserted. The relays are capable of carrying 8 amps at 250 VAC.

If the relays are set to momentary during the software set-up phase, they will close for 200 milli-seconds each time they are asserted. If the relays are set to latching, they will remain closed until the beginning of the next cycle or until a reset is issued.

In order to issue a Reset, a voltage needs to be placed across PIN 5 and PIN 4. If the voltage is DC, PIN 4 should be set to GROUND potential and PIN 5 should be issued a positive potential. If an AC voltage is used, the neutral can be placed on either PIN 4 or 5 and the hot lead can be placed on the remaining pin.

WARNING: R25 limits the current into the Opto-Isolated reset. A 2.4K resistor is placed in this spot when the unit is manufactured. This value will work well when a +24VDC Reset is issued. If a different potential is used, this resistor value may need to be changed. A good rule of thumb is to limit the current to 10 milli-amps.

Power:



POWER ENTRY/FUSE HOLDER

The TCV is capable of being powered by either 110 VAC or 240VAC 50/60Hz. In order to accomidate this range of voltage, a voltage selection device is incorporated in the fuse holder of the power entry module.

In order to change the voltage selection, the fuse holder needs to be removed from the power entry module. The voltage selection device slides out of the fuse holder and can be turned around and replaced to accomidate different voltage input requirements.

A window displays the AC input voltage selection.

WARNING: Applying 210~250VAC to the power entry while the unit is set-up for 110VAC will harm the unit. Be certain that the appropriate voltage range has been selected for operation before powering up the device.

Front Panel Indications:

TCV Display

Four LEDs are visible on the front panel of the TCV. These LEDs represent Power, Accept, Reject, and Strength/Program.

The Power LED flashes constantly while in normal operation. This LED will turn on solid when the TCV is placed in "learn" mode.

The Accept and Reject LEDs constantly show the status of the last cycle. If a Reset is issued, these status LEDs will turn off.

The Strength/Program LED has two functions. In the normal operation mode this LED will give an indication of how strong the signal being received is. If the signal is very strong this LED will be green. A moderately strong signal will turn this LED yellow. Weak signals cause the LED to glow red.

The Strength/Program LED also performs a second function while the unit is in the "learn" mode. This feature is described in detail on Page 4 of this manual.

PTFM Batteries:
The transmitters use a 12-Volt alkaline battery type A23 (Energizer) or MN21 (Duracell). A battery will last for approximately 25,000 ¼ second cycles.

The TCV is equipped with a low-battery indicator consisting of four short beeps following a received signal.

Trouble Shooting Guide:

Problem:
The TCV will not power up.

Possible Problems/Solution:
1. The 110/240 selector is in the wrong position.

If the unit is being powered by 110VAC and the selector was accidently set to 240VAC, this situation can be rectified by changing the voltage selector to 110VAC. Chances are no damage occurred to the unit.

If the unit is being powered by 220VAC and the selector was accidently left on 110VAC, chances are the unit has sustained damage and will need to be repaired.

2. The fuse has blown.

Pull the fuse out of the fuse holder. There may be a visible indication that the fuse has blown (brown discoloring on the glass, etc...). A multi-meter can verify that the fuse has blown. If the fuse is blown, the resistance measure across the fuse should be infinite. If the fuse is functional, the resistance should be very low (0 ~ 5 ohms).

Problem:
When the TCV powers up the Power LED comes on solid. Then , the Strength/Program LED comes on solid red and stays on.

Possible Problems/Solution:
1. The unit is in "learn" mode.

Exit the learn mode. Turn the key-switch back to the "neutral" position. If the power LED does not return to its normal cadence, turn the key-switch to the "program" position and then back to the "nuetral" position. The power LED should return to its normal cadence.

Problem:
The TCV will not recognize the PTFM wrench at all. The Strength indication is not even signifying that a signal is being received.

Possible Problems/Solution:
1. The PTFM wrench has a dead battery.

Replace the battery in the PTFM wrench.

2. The PTFM and TCV are operating on different channels.

Refer to the Channel set-up guide on pages 2 and 3 of this manual. Be sure that the TCV and the PTFM are set to the same channel.

Problem:
The TCV will not recognize the PTFM wrench. However, when the wrench is used signal strength is being indicated by the Strength/Program LED.

Possible Problems/Solution:
1. The TCV has not "learned" the PTFM's seed code.

Refer to the "teaching" section of this manual on page 4 and re-learn the PTFM's seed code.

Problem:
The TCV only intermitantly recognizes the PTFM wrench.

Possible Problems/Solution:
1. The Time Between Cycles timer is set too long.

Refer to timer programming on Page 2 of this manual and shorten this timer's duration.

2. The wrench is operating on the edge of the transmission/reception range.

Monitor the Strength indication. If the TCV is only showing red and yellow indications when the TCV does receive data, the box may need to be relocated so that a stronger FM signal can be received.

Problem:
The TCV relays are not working properly.

Possible Problems/Solution:
1. Contacts are not wetted with system voltage.

In most cases, when the relays are used a potential is placed on the Relay Common and then read back on the Accept Relay and Reject Relay pins. To be sure that relays are working properly a multi-meter can be used. Every time a relay closes the corresponding output should "short" to the Relay Common. A multimeter will read this "shorted" state as very low resistance (0~5 ohms). While the relays are open, the resistance should be infinite.

2. The relays are set as "momentary" and multi-meter or PLC is having problems capturing the event.

When the relays are in momentary mode, they will only close for 200ms when asserted. Often this event may be to short for a PLC to respond to (especially if the ladder logic is long).

Try setting the Relays to "latching" and issuing a Reset as soon as the status is realized by the PLC.

Problem:
The TCV cannot "learn" the PTFM wrench's seed code.

Possible Problems/Solution:
1. The TCV and PTFM wrench are operating on different channels.

Program the TCV to be on the same channel as the PTFM.

2. The wrench's battery is dead or the wrench is malfunctioning.

Confirm this by checking to see if a Signal Strength indication is being received by the TCV. If there is a Signal Strength indication, the wrench is functioning properly. If no Signal Strength indication occurs, try replacing the battery in the PTFM wrench.

Problem:
The Reset on the TCV will not work.

Possible Problems/Solution:
1. The resistor in R25 is too large.

The TCV ships with a 2.4K resistor in R25 to limit the current into the opto-isolator. A 2.4K resistor will work well if 24VDC is being used to issue the reset. If the voltage is less that 24VDC, this resistance should be reduced so that the opto-isolator receives approximately 10 milli-amps.

2. The resistor in R25 is too small.

If the resistor in R25 is too small, the opto-isolator will burn out (just like a light bulb does). If a voltage greater that 24VDC is being used to issue the Reset, increase the resistance in R25 so that only 10 milli-amps is passed through the opto-isolator. The opto-isolator may need to be replaced if this is the case.

3. The polarity is backwards.

If a DC voltage is issuing the Reset, the positive potential should be placed on the Reset Pin 5. The Ground potential should be placed on Reset Common Pin 4.

Problem:
The Software cannot communicate with the TCV.

Possible Problems/Solution:
1. The cable is not a null-modem cable.

Make sure the cable is a null modem cable (RX is connected to TX etc...).

2. The wrong Comm port was selected in the software.

Select the right comm port and try again.

3. The Comm port has never been turned on in the PC's BIOS.

Often times (especially with laptops that contain modems) the comm port in a PC is not turned on in the BIOS. If this is the problem, be sure to find out if a modem is installed in the machine that is being used. If the modem is using Comm Port 1, try to set the PC's Comm Port to 2.

4. Another piece of software has already opened the Comm port that the TCV Programming Utility is trying to use.

If the PC being used has two Comm Ports, try to use the other one. Or, close the application that is making use of the port. Often, PLC programmers communication packages will start automatically when the PC enters windows. If this is the case, it may be hard to tell that the application is running and causing the conflict (this is particularly true of Allen Bradley RS Linx).

Problem:
When the TCV powers up, the Reject LED is flashing.

Possible Problems/Solution:
1. The data in the EEPROM was corrupt.

Use the software to download a new set of parameters. After the new parameter set is downloaded, cycle the power on the TCV (turn it off and then back on again). If the Reject LED continues to flash, replace the EEPROM.