HEXAGON
METROLOGY

COMMON SCALE INTERFACE (CSI)

USER'S MANUAL

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Conventions

The following conventions are used in this manual to distinguish between various kinds of information.

Note: Notes give important information taken from the text, which may be useful in ensuring that the equipment is used to its full potential.

C A U T I O N
Caution messages indicate potential damage to the equipment or loss of data and tell you how to avoid the problem.

W A R N I N G
Warning messages indicate the potential for bodily harm and tell you how to avoid the problem.

1. Safety Information

	W A R N I N G
⚠️	**All the operations described in this document for which you are responsible must be performed in accordance with the national and company safety regulations.**

Standard CSI

The standard CSI may present a shock hazard if water or other liquids are allowed to enter the unit. This is an electronic device. As with any electronic device standard safety precautions should be observed when connecting or disconnecting system cables. Please see your specific CMM system user manual for supplemental information.

Physical Weights & Dimensions:

Unit weight – 1420 grams (50.1 oz)

Unit length/depth – 203.96 mm (8.03 inches)

Unit width – 254.76 mm (10.03 inches)

Unit height (flat on feet) – 61.98 mm (2.44 inches)

2. CSI Description

Introduction

The Common Scale Interface (CSI) was developed for use with manual coordinate measuring machines (CMM). The CSI is an interface for the translation of encoder signals between a manual machine and the host PC-DMIS software running under Windows. The CSI was developed as an external interface to accompany any approved PC utilizing USB communication. It is a replacement for the XnPCI cards that have been used previously with manual CMM's. The CSI does not require a PCI card slot in the PC (as the XnPCI card did) since it uses the standard USB interface. There are several different versions of the CSI depending on the encoders that it will be used with (Brown and Sharpe, TESA, TTL, etc).

The CSI has an integrated scale tuning function used to optimize the encoder signals. The user can use this function whenever the signal of any axis of the machine shows a change in signal strength. The tune function is performed initially in the factory for the specific CMM so it should only need to be performed again if there is a change in signal strength. A change in strength can be detected by running the CSI in "Test mode" periodically (see section 5). You may also get error messages when running PC-DMIS that indicate you should check the signals in test mode (see section 6 on Hardware Troubleshooting). The signals can be corrected using the "Tune" pushbutton on the front panel which toggles mode sequences for tuning encoders. This is outlined in this manual under section 5.

Other on board functions of the CSI includes the probe signal, hand switch, and provisions for an optional 4th axis. The touch trigger probe signal can be turned off through use of the hand switch when a hard probe is used.

This user guide assumes the CSI interface support for PC-DMIS has already been installed on the PC being connected to the CSI hardware. The CSI installation guide describes the process to install the CSI software support.

Other topics

Cable connections for the CSI box can vary depending on machine cabling. The prominent design is meant to connect directly to Brown&Sharpe legacy frames, these machines include but are not limited to the MicroVal, Gage 2000, and MicroXcel. All other applications of the CSI will usually require an adapter set of cables as currently used with XnPCI systems.

Most cable adapters will consist of a 37 pin input cable to the CSI which then terminate to the machine cables as required. This cable will also accommodate the probe and the hand switch connections. Terminations to the machine cables can vary depending on contact and connector differences and may require some on site modifications where needed. This practice is not uncommon when using in a retrofit situation. Figure 1 shows the CSI connected to a CMM (desktop or laptop PC connected to the CSI is not shown).
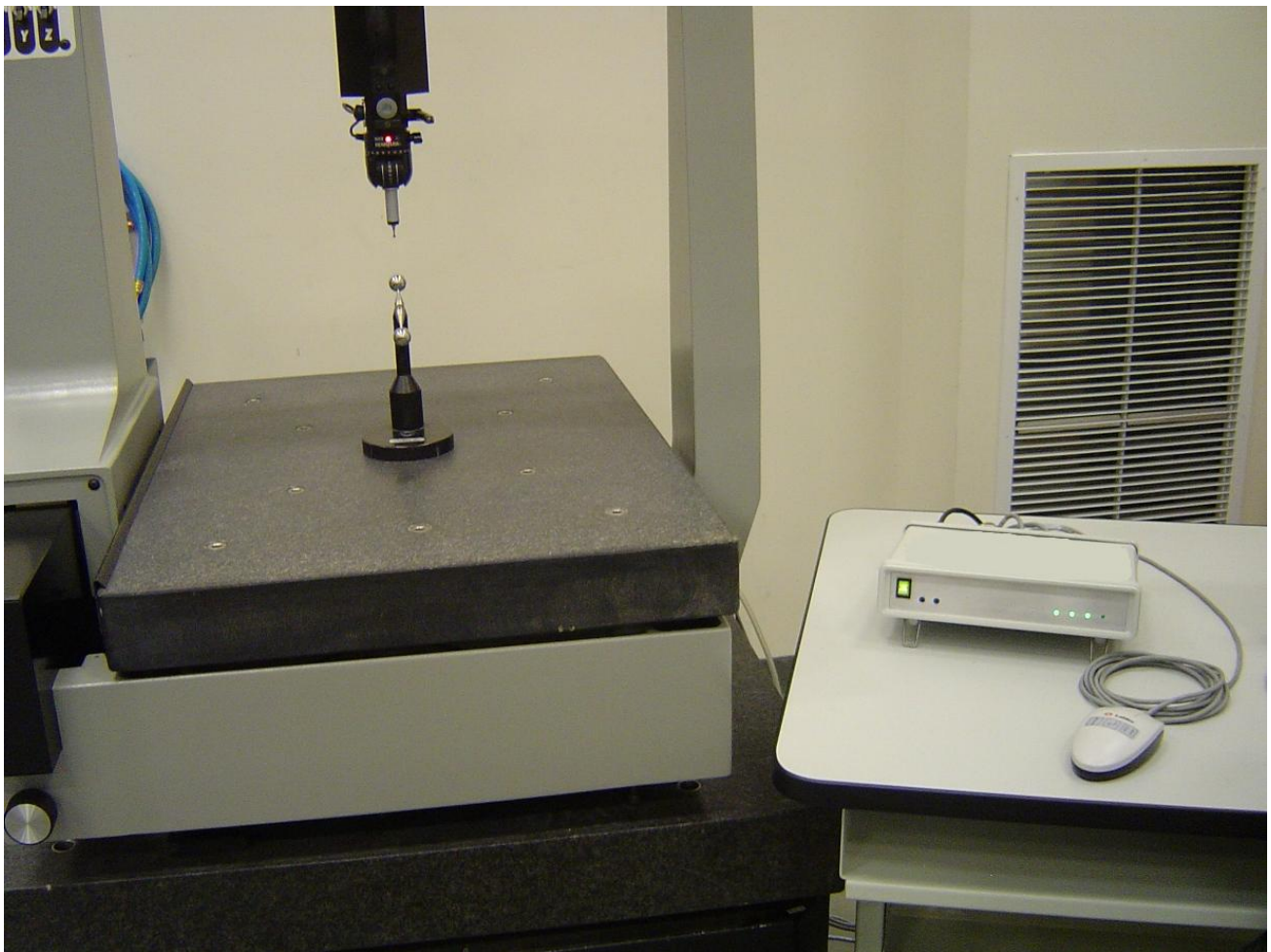

Figure 1. CSI box connected to a CMM. Hand switch is connected to rear of CSI box.

3. Components

Common Scale Interface (CSI)

Main CSI Box

V-Infinity Power Supply (15V/4.0A)

Earth Ground Adapter

Hand Switch with built in speaker

Required Cables

CMM specific cabling to connect to the X,Y,Z, and probe inputs on CSI box

Standard USB Cable with Type A/B connectors (connects from USB HOST port on CSI to PC's USB port)

Optional cables for connecting to Hyperterminal (as described in section 5 – Advanced CSI Usage):

> - Second USB Cable with Type A/B connectors (if connecting to USB service port)
>
> - RJ11 to Female DB-9 connector (if using standard COM port on PC to connect to CSI with hyperterminal)

4. Basic CSI Usage

Getting Started

The use of the CSI is strictly for operational use and is not considered a repair device for a substandard machine. Please be sure that the machine to be used with the CSI is in good operating condition to minimize problems.

   1.1 Connect CSI to Machine.

      The CSI comes with an AC/DC converter power supply and an earth ground adapter. Attach the CMM earth ground wire to the earth ground adapter, and attach earth ground wire from stud on the rear panel of the CSI box to the earth ground adapter. <u>Do not power up at this time</u>.

      Connect machine adapter cable (CMM encoders to CSI inputs) if supplied. Attach all machine cables to the designated connectors on the back panel of the CSI box (see Figure 2 and 3) and fasten securely. Do not attempt to attach cables from the CMM to the CSI if the interface connections are not compatible. This can void warranty of the product.   If termination to the machine requires modification, a Hexagon Metrology representative should be contacted for a service technician to do this type of work.

Figure 2. Rear of the CSI box (this photo is the Tesa/B&S version of CSI, TTL version will look different). Connect CMM cables to designated connectors prior to powering on the CSI box.

Figure 3. Rear of CSI box with cables connected. USB service cable (far right) is connected in this photo but is only required if using command interface described in section 5 of this manual.

1.2 Setup CSI

Set the CSI unit on a sturdy workstation table near the PC-DMIS host computer. Be sure that the attached machine cables or power and ground wires are not over extended or cause the unit to be pulled or slid off the table.

Powering On the CSI

Prior to powering on the CSI, make sure that you have followed instructions from the "Getting Started" section. Verify that the cables are connected to the correct inputs (X axis cable is connected to X input, etc.). Connecting the USB cable between the CSI "HOST" port and PC is optional at this point. It may be connected later or you may connect it now.

C A U T I O N

The 2 buttons on the front of the CSI (tune and test) should not be touched during power up or after powering up unless an auto tune of the encoders is required or some other operation requiring button use is desired (see sections 4 and 5). If the CSI has already been tuned for the CMM being used, then there is no need to use these buttons. Pressing either button for less than 1 second will not have any effect when the CSI is powered up normally. However if the tune button is pressed/held for more than one second (until the LED's turn blue) then the CSI will be placed into "Tune Mode". If the "Test" button is pressed/held for >5 seconds then the CSI will be placed into "Test Mode". If the tune button is accidently pressed/held for more than one second and the CSI enters a tune mode (one or more of the LED's is blue) you may power off the CSI box BEFORE touching the tune button again, then on next power up the LED's should be green and the CSI is in normal operating mode. You may also exit "test mode" by powering the CSI off/on.

Figure 4. Front of the CSI box. Power switch is located on the far left. Photo is with the power switch in the "Off" position.

With the CSI power supply connected to the power input ("DC IN" connector) on the back of the CSI box, the switch on the front of the CSI box can be used to power on/off the unit. The switch will light up when the unit is powered on (Figure 5). Flip the switch on now to power on the CSI and verify the switch light turns on. If it does not turn on, verify the power supply is plugged into an outlet and the input to the CSI is properly connected. The LED's on the front panel will be lit with a specific color to represent the results of the last "Tune" that was performed. The tune results are saved internally on the CSI box. Since results are saved, when the CSI is powered off and then on again it will set the LED's to the same color. GREEN LED is a "Good" tune, YELLOW is a "Fair" tune, and RED is a "Bad" tune (also set to RED when defaults are loaded as described in section "Initializing CSI to Default State"). Note that for TTL version the LED's will always be green if the CMM cable for the encoders is connected to the CSI box and no errors are detected from the TTL encoders, or red if the cable is disconnected or errors are detected.

Figure 5. CSI powered on. The X,Y, and Z LED colors are dependent on the last "Auto Tune" operation that was performed.

Note: If the USB cable is currently connected between the PC and the HOST USB port on the CSI, and you have never powered on the CSI with the USB cable connected to this USB port on the PC, you will get a "Found New Hardware" message from Windows when the CSI is powered on (see Figure 6). The "CSI for PC-DMIS Software Install Manual" provides details on installing the USB driver for the CSI in this case, but all that is necessary is to leave the defaults selected and choose "Next" and "Continue Anyway" (see screens in Figure 6) to complete the install. Once installed for this USB port, you will never get this message again. However if you plug into a different USB port on the PC you will have to complete the USB driver install for that port as well

Figure 6. "Found New Hardware" message (Windows XP example) will appear if this is the first time the CSI box is powered on with a USB cable connected from the "HOST" port on CSI to the PC. Select "Next" and "Continue Anyway" and the install will complete.

Auto Tune Axis Encoder Inputs

Prior to using PC-DMIS with the CSI it is necessary to "Tune" the X, Y, and Z axis encoder inputs. For the TTL version of CSI it is not necessary to "Tune" the axes so auto tuning is not supported for the TTL version. The tune function is normally performed at the factory with the CMM but there may be instances when the user must perform the tune function (for example if using CSI box with a different CMM, using the CSI as a replacement for an existing XnPCI card solution, etc.). The CSI supports tuning of the encoder inputs via several different options:

1. Tune all 3 Axes at the same time using Tune button

2. Tune one Axis at a time using Tune button

3. Tune all Axes or one Axis at a time using commands entered via Hyperterminal running on the PC (requires connection to either the COM port or to the USB Service port on the CSI)

In this section only tuning via the "Tune" button is covered. See section on "CSI Commands" (in section 5) for using the COM port or USB Service port to perform the tune.

Tuning the axes with the "Tune" button involves the following steps:

1. Select the Axis (or all Axes) that is to be tuned.

2. Tune the Axis (or Axes) by pressing the tune button briefly while moving one or more Axes.

Details on how to perform the above 2 steps are as follows.

1. Select the Axis or all Axes to Tune

The LED indicators on the front panel are set to a BLUE color to indicate the Axis is in "Tune Mode" (see Figure 7 and 8). To enter tune mode for one Axis or all Axes, press and HOLD the button labeled "Tune" for more than one second. Once the LED for the axis you want to tune is BLUE, release the button immediately. If you continue to hold the button the CSI will simply rotate through all the tune modes. When none are BLUE, pressing the tune button for less than 1 or 2 seconds will have no effect. Below are the "Tune Modes" that are rotated through while holding down the Tune button:

>   All 3 Axes LED's Blue (Tune All Mode)

>   X Axis LED Blue (Tune X Axis Mode)

>   Y Axis LED Blue (Tune Y Axis Mode)

>   Z Axis LED Blue (Tune Z Axis Mode)

>   No Tune – LED's are set to the color of the previous tune result (none are blue)

2. Tune the Axis or all Axes

After selecting the "Tune Mode", you will now use the Tune button to perform the tune function. Begin moving the CMM Axes or Axis you are tuning slowly and press the tune button briefly (less than one second so you do not change the tune mode) while continuing to move the Axes/Axis. Wait until the LED(s) for the Axis/Axes being tuned turns GREEN (good), YELLOW (fair), or RED (failed) to indicate the tune operation has completed. You may stop moving the Axis only after the tune has completed. If you move the axis too fast or stop moving the axis during the tune process, the tune may fail (Red LED). Repeat steps 1 and 2 as many times as necessary until all 3 Axes have been successfully tuned (either green or yellow).

Figure 7. CSI box with all 3 LED's blue. The tune mode is set for "Tune all".

Figure 8. CSI box with "Y" axis LED blue. Tune mode is set for "Tune Y".

Running PC-DMIS With CSI

This section is not intended to describe the complete operation of PC-DMIS, but rather just covers a few important functions that are specific to using the CSI hardware with PC-DMIS.

Assuming that the CMM encoder inputs to the CSI have all been tuned successfully, the CSI box is now ready to be used with PC-DMIS.   If you have not already connected a USB cable from the CSI port labeled "HOST" to the PC, then do that now. As discussed in the section "Powering on the CSI", you may get a "Found New Hardware" message from Windows if this is the first time the CSI has been connected to this USB port on the PC.   In that case, install the USB driver as described in that section.

The "Stretch" values configured with the PC-DMIS settings editor should already be set correctly for the CMM being used, but you may want to confirm (see Appendix B for settings). Start PC-DMIS as you would normally.   The following message is displayed each time PC-DMIS is started when using CSI:
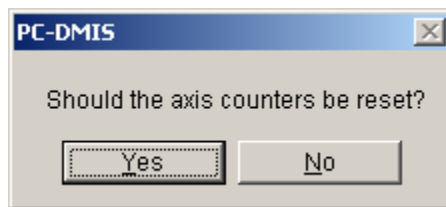

Figure 9. "Axis Counters Reset" query message from PC-DMIS when first started up.

NOTE: Make sure that when PC-DMIS is started the touch trigger probe is not deflected (if using a touch trigger probe). The reason for this is that the CSI interface software automatically detects if a "touch trigger probe" or a "hard probe" is attached when PC-DMIS is started up and configures its data acquisition method (for latching data on probe hits) based on whether a hard probe or touch trigger probe is being used. If a touch trigger probe is deflected when PC-DMIS is started then it will appear as if a hard probe is being used which will result in the CSI interface incorrectly configuring data latching method.

Also note that if using a touch trigger probe the red LED on the probe will only turn off/on when probe is deflected/released when PC-DMIS is running and has successfully initialized the interface to the CSI hardware. The initialization occurs after the axis counters reset message (Figure 9) has been cleared. This is because the CSI software that interfaces PC-DMIS to the CSI hardware controls the probe LED.

Resetting the Axis counters is only necessary if they have not been reset previously. Note that if the CSI box has been powered off since the last time the axis counters were reset, then they MUST be reset again. For example if PC-DMIS was started, axis counters reset, then PC-DMIS is exited and started again without ever powering off the CSI box, a reset is not necessary. Choose yes to continue with the counter reset or no if you do not need to reset them.

Selecting "Yes" will bring up the message below. Note that with CSI hardware (not the case with the XnPCI card) it is necessary to first move to home position, then select ok, then move AWAY from the home position in order to complete the axis counter reset.
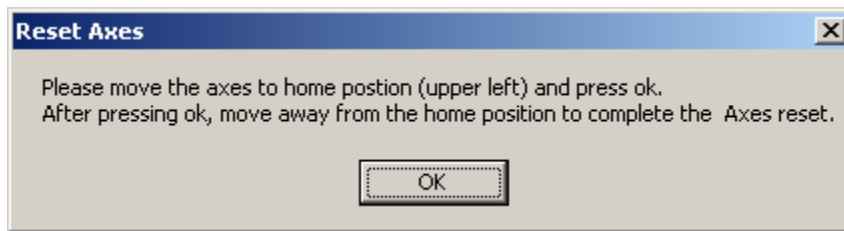
Figure 10. "Reset Axes" prompt instructing user on sequence of steps to reset the axes.

C A U T I O N
Make sure to follow the sequence exactly as describe in the message displayed in Figure 10. If the axes are moved away from the home position and then "OK" is selected, the "Home" position will be incorrect. Be sure to select "OK" while the axes are in the home position, then move away to complete the axes reset.

After moving all axes away from the home position the message below is displayed. **Until this message is displayed, the axis counters will not be reset and PC-DMIS will not be able to read the axis position.** Reset should complete immediately after moving away from the home position. Make sure you move ALL 3 axes away from their respective home position in order for the reset to complete. If for some reason the reset does not complete successfully (the message below never gets displayed even after moving all 3 Axes away from home position), then see the section on "Hardware Troubleshooting" for possible causes and resolution.
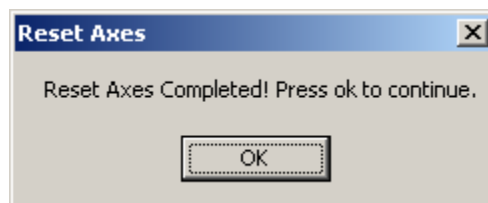

Figure 11. "Reset Axes" completed successfully message.

If there is any problem with the connection/communication between PC-DMIS and the CSI hardware, you may get an error message like below instead of getting the "Reset Axes" message. See section on "Hardware Troubleshooting" if this occurs.
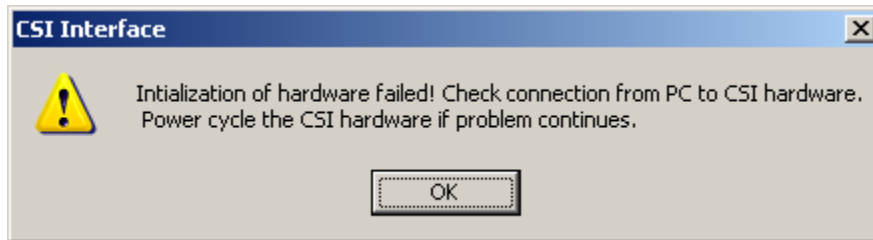

Figure 12. CSI hardware interface initialization error message.

Assuming the reset completes successfully, select "Ok" to continue (see Figure 11). PC-DMIS is now able to use the CSI for taking measurements.   The next page (Figure 13) shows an example of the screen that appears after selecting ok to continue. If any of the 3 axes are moved at this point, the X, Y, and Z position values at the bottom of the screen should change for the axis that is being moved. **If the values are not changing when moving the axis then it is recommended to exit PC-DMIS, power off/on the CSI box, then restart PC-DMIS and repeat the axes counters reset.**
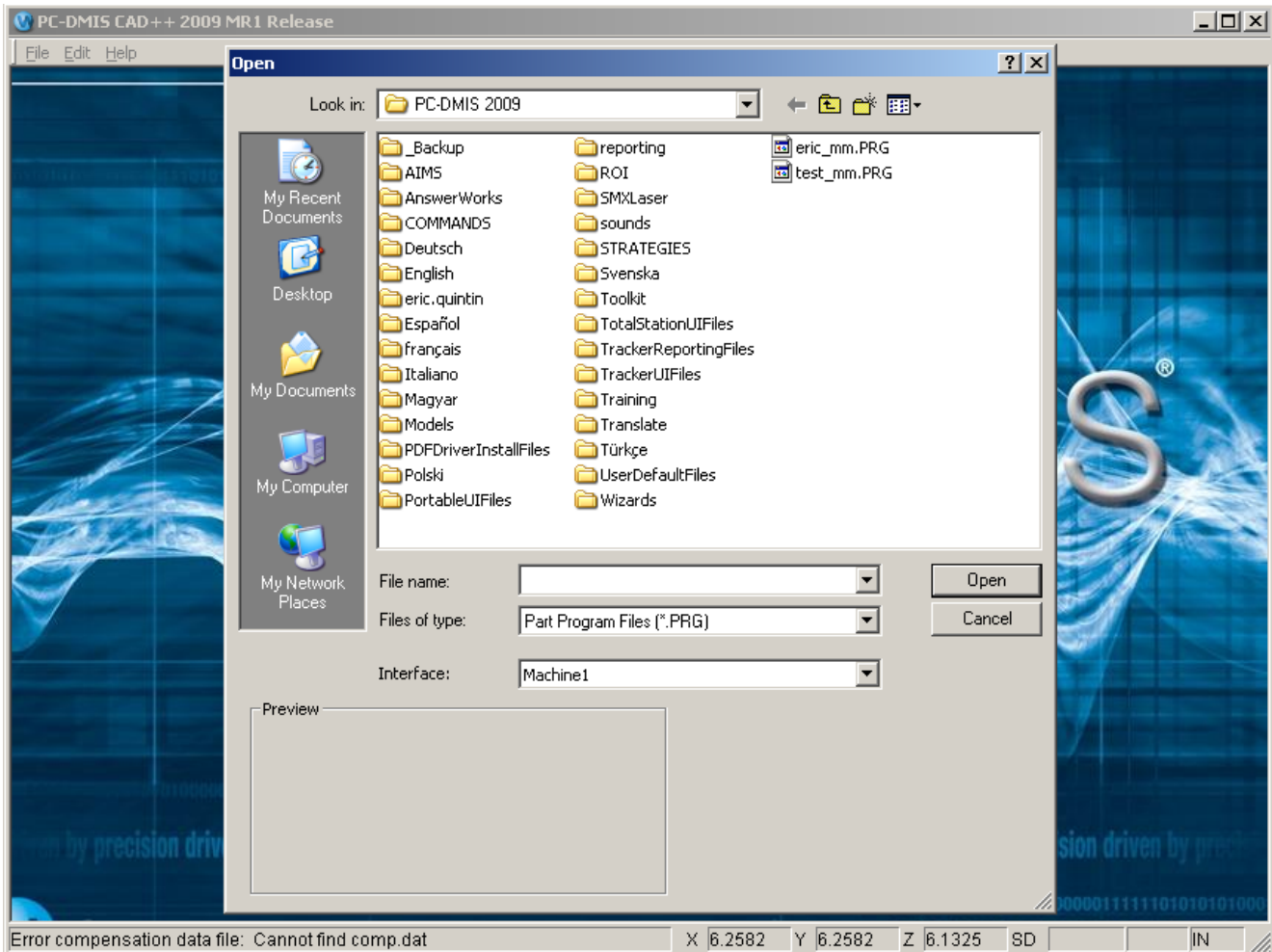
Figure 13. Example of PC-DMIS screen that is displayed after completing axes reset.

5. Advanced CSI Usage

This section covers more advanced topics than the previous section. The functionality in this section is particularly useful for service personnel.

Connect to COM Port or USB Service Port

There are many commands that the CSI box supports which can be used by advanced users. Typical operation does not require their use, but service personnel should be aware of them and understand some of the more useful commands. Status information is also displayed using the COM port connection described in this section.

A communications program such as Hyperterminal uses either a standard COM port on the PC or USB port connected to the CSI "Service" port to interact with the CSI. Hyperterminal is available on Windows XP but for Windows 7 you need to download hyperterminal and install it or copy it from an existing Windows XP installation (hypertrm.dll and hypertrm.exe). You may also choose to use another communications program such as TeraTerm, but Hyperterminal is recommended. If using a standard PC COM port then a special cable is used to connect from the PC's COM port to the CSI (RJ11 to DB9 female). If using the CSI USB "SRVC" port you may get the following message if you have never connected the services port to the same USB port on the PC previously. Simply chose "Next" and then "Continue Anyway" and the required driver will install.

Figure 14 "Found New Hardware" message when connecting CSI USB Service port to USB port on PC (Windows XP example, under Windows 7 it will install automatically).

One issue with using the USB Service port is finding out what COM port it has been assigned on the PC side. This can be determined using Windows "Device Manager". Device Manager can be started using the Windows control panel applet "System" and choosing the "Hardware" tab (device manage in Windows 7 may require slightly different method to run it). Below is an example where it has been assigned to "COM9" for this PC. Hyperterminal needs to be configured to use COM9 in this case. If the USB cable is inserted into a different USB port on the PC, then the assigned COM port will be different for that port. It is suggested to always use the same USB port on the PC to avoid this issue so that you can always use the same Hyperterminal configuration.
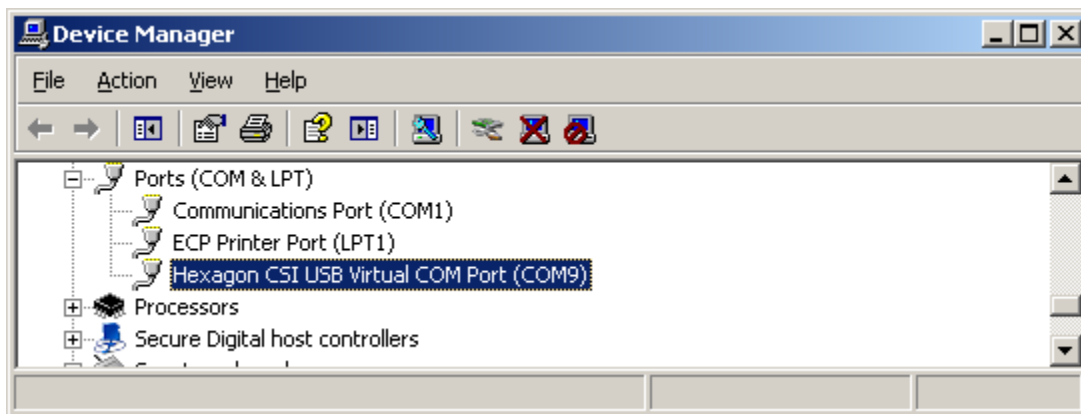
Figure 15 Use Windows device manager (accessible through control panel) to determine which COM port the CSI service port is set to. It is COM9 in this example.

Whether you chose to use a standard COM port on your PC or the USB connection, hyperterminal (or other program you choose to use) must have the baud rate, stop bits, handshake protocol, etc., configured. The example below is for the Hyperterminal COM port configuration screen (using COM1 in this example).
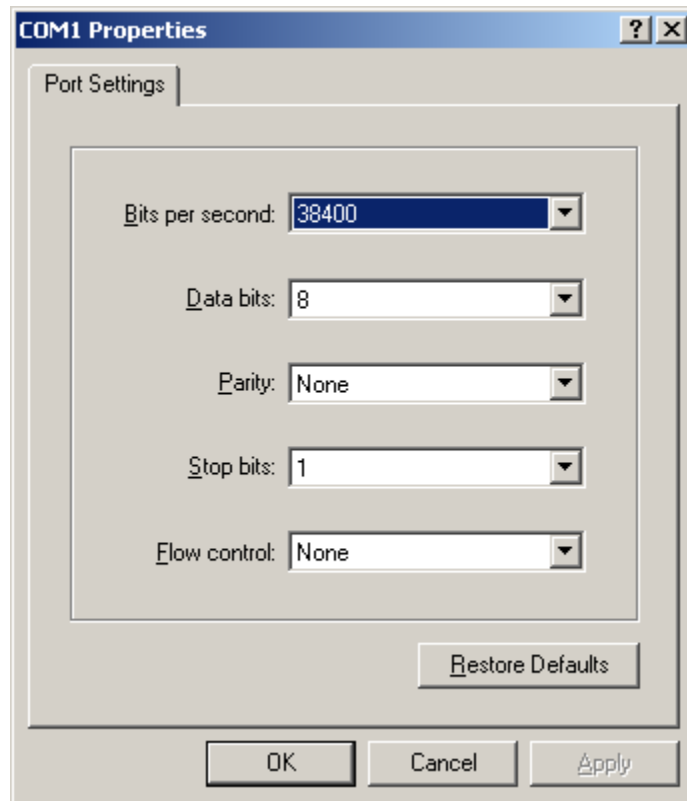
Figure 16 COM port settings for CSI connection to service port.

After configuring the COM port, you should now be able to "Connect" to the CSI box and issue commands. The first command you can try is the "v" command which provides the version information. The command prompt is the ">" symbol. Simply type the "v" command on your PC while in the hyperterminal window as shown in the following 2 screens. The "v" command will also clear the hyperterminal screen but most commands will not.
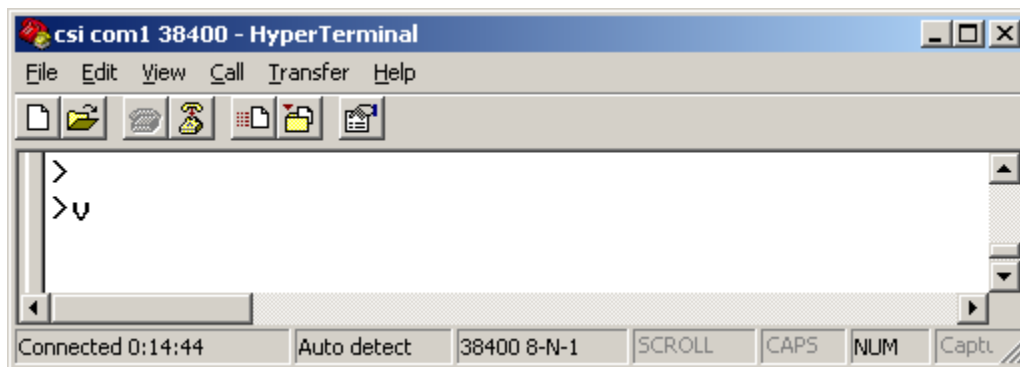
Example:

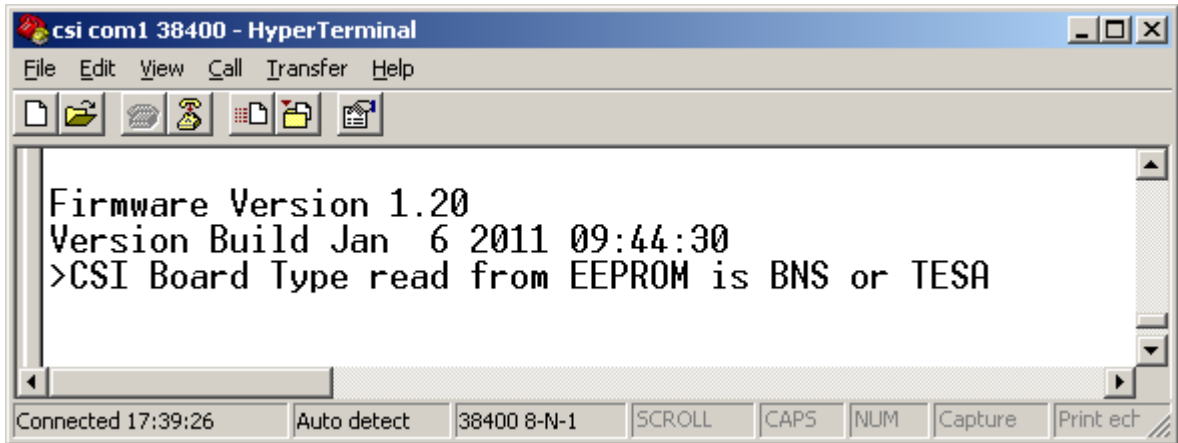**Figure 17** The CSI command prompt in hyperterminal window.

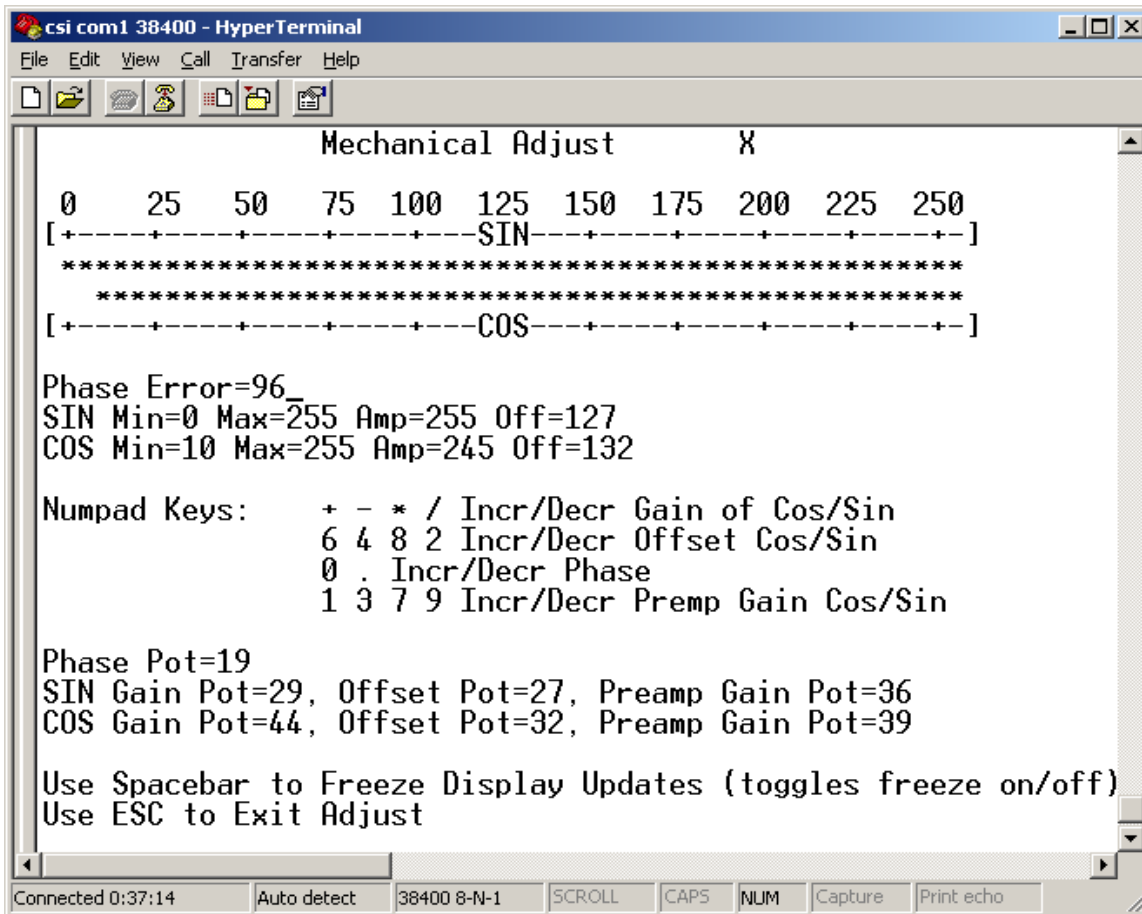**Figure 18** Example out of the "v" (version) command.

NOTE: If using the USB port for COM port connection to hyperterminal, you should be aware that if the CSI is powered off while hyperterminal is connected to the USB COM port then the connection is lost and will not automatically "re-connect" when CSI is powered on again. This is because the USB COM port on the PC effectively "goes away" when the CSI is powered off and hyperterminal does not know how to handle that. The solution is to "disconnect" using the icon in hyperterminal (or the "Call" menu item for disconnect) BEFORE powering off CSI, and then re-connect after powering on the CSI. This is not an issue when using a standard COM port on the PC.

CSI Commands

At the command prompt you can enter the "h" (help) command to get a complete list of supported commands (see appendix A for complete list). In this section some of the more useful commands are discussed. Note that for TTL version of CSI box the auto tuning functionality is not applicable so the mechanical adjust and auto tune commands are not applicable.

Mechanical Adjustment Commands: mx,my,mz,mw

For service technicians, mechanically adjusting the encoder/scales is a common task. The CSI cannot auto tune the encoder signals if the encoders are not mechanically adjusted properly because the signal strength may be too small or missing completely. The mx, my, mz, and mw commands are very helpful when performing mechanical adjustments. The following screen appears which provides a "graphical" view of the encoder signal the CSI box is reading.   The example below shows the signals for the X axis encoder while the X axis is being moved (represented by the asterisks "*"). The signal has a good amplitude that is sufficient to perform an auto tune.

Figure 19. "Mechanical Adjust" (mx) command screen for X axis.

The following example (Figure 20) shows that the signal is very low and may not tune successfully. **Note that the mechanical adjust commands should normally be used when the CSI default values are loaded (see section "Initializing CSI to Default State")**. This is because the defaults set the E2 Pots to their midrange value. If you want to just adjust one axis and do not want to reset all values by loading defaults, an alternative is to use the "Numpad" keys as shown in Figure 19 (numlock must be ON) to manually set the E2Pot for the sine and/or cosine signal amplitude and/or offset to its midrange value (32). After incrementing/decrementing the E2Pot value with the appropriate numpad key so that the midrange for the E2pot is set, then the encoder signal can be checked while moving the axis. If there is a sufficient signal when the defaults are loaded then an "Auto Tune" is likely to succeed. Conversely if the amplitude of the signal is very low (as below), then it is likely to fail the auto tune.   The encoder should be mechanically adjusted to provide a signal that has an amplitude in the range of about 150-240.
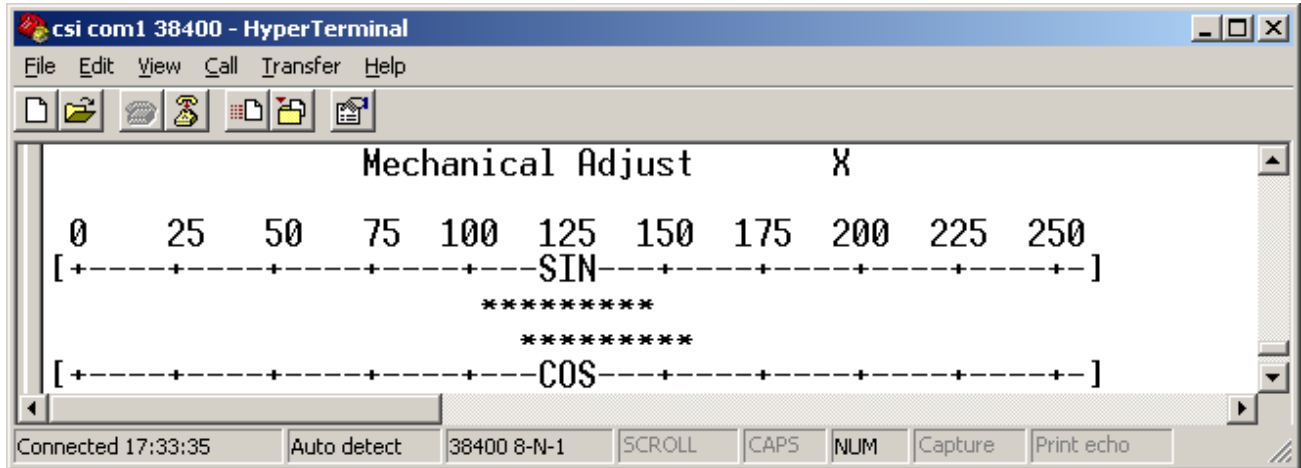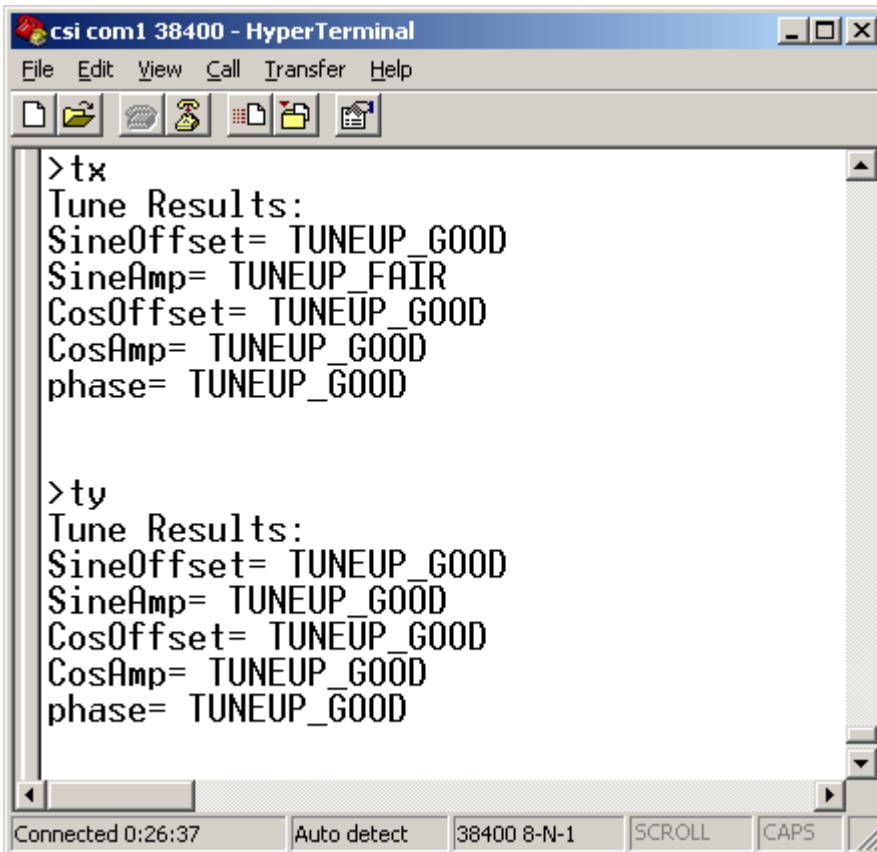

Figure 20. Mechanical adjust command screen example with the X encoder signal at a low value. This indicates the encoder requires mechanical adjustment before attempting to tune this axis.

Auto Tune Commands (ta,tx,ty,tz,tw)

As mentioned in section 4, the "Auto Tune" function can be performed using either the "Tune" button on the CSI or using commands entered via hyperterminal. The commands are: "ta" (Tune All), "tx" (tune X), "ty" (tune Y), "tz" (tune Z), and "tw" (tune W). Most systems do not use a "W" axis.

The method to tune using a command is much like using the "Tune" button except you do not have to enter a "Tune Mode" since entering the command will immediately tell it which Axis (or all axes) to tune. The important thing to understand is that the Axis should be moving when the command is entered as it will immediately start reading the signal and attempting to tune it. Below is sample output of the "tx" and "ty" commands. Note that the tune results are displayed for each value.   If only one is "TUNEUP_FAIR" and the rest are

"TUNEUP_GOOD" then that will result in the LED on the CSI being GREEN. If 2 or more are "TUNEUP_FAIR" then the LED is YELLOW. If ANY are "TUNEUP_BAD" then the LED will be RED.
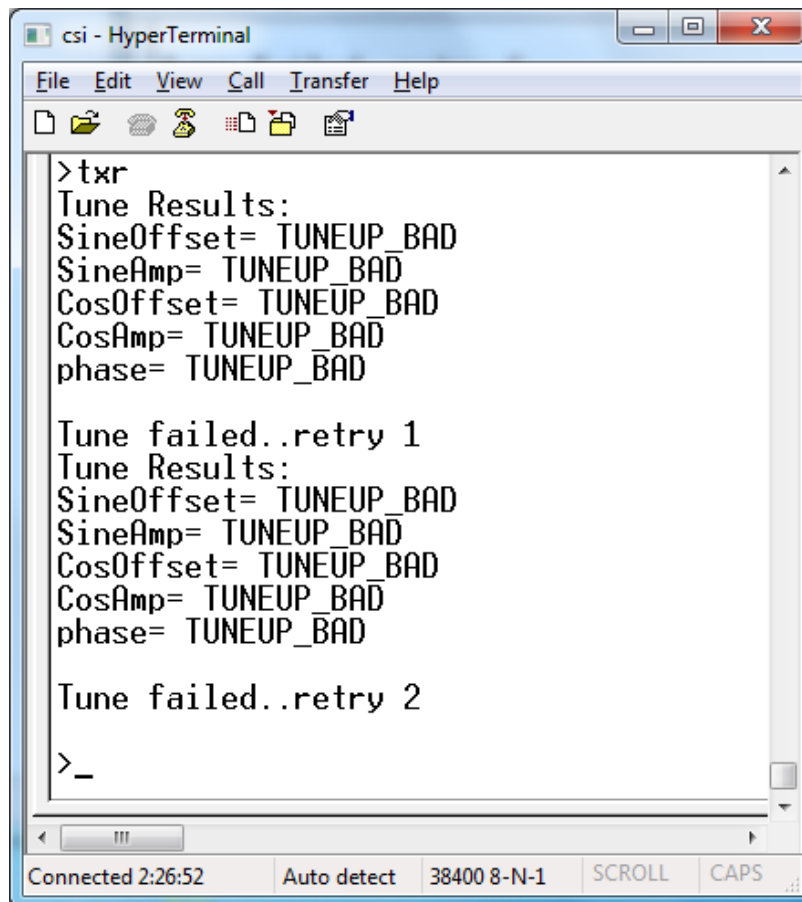


```
>tx
Tune Results:
SineOffset= TUNEUP_GOOD
SineAmp= TUNEUP_FAIR
CosOffset= TUNEUP_GOOD
CosAmp= TUNEUP_GOOD
phase= TUNEUP_GOOD


>ty
Tune Results:
SineOffset= TUNEUP_GOOD
SineAmp= TUNEUP_GOOD
CosOffset= TUNEUP_GOOD
CosAmp= TUNEUP_GOOD
phase= TUNEUP_GOOD
```

Figure 21. Tune results displayed after attempting to tune the X and Y axes.

Auto Tune Commands with Retry (txr, tyr, tzr, twr)

If using version 1.30 (or newer) of the CSI firmware then the txr, tyr, tzr, and twr commands are available. These are enhanced versions of the previously described tx, ty, tz, and tw auto tune commands. Unlike the standard auto tune commands, these commands will continuously retry tuning the Axis until it either tunes successfully (FAIR or GOOD) or the user may abort/exit the auto tune by pressing the "ESC" key. The advantage to using these commands over the standard auto tune commands is that the user does not have to keep typing in the command to start the auto tune if it fails. The user starts the auto tune by typing in the command and then starts moving the target axis until the auto tune is successful. Below is an example screen of the txr command. On the first screen the auto tune was aborted with the "ESC" key before the tune completed successfully. In this case the X axis LED on the front panel would be red since the auto tune failed. On the second screen the auto tuen succeeds on the 7th retry.
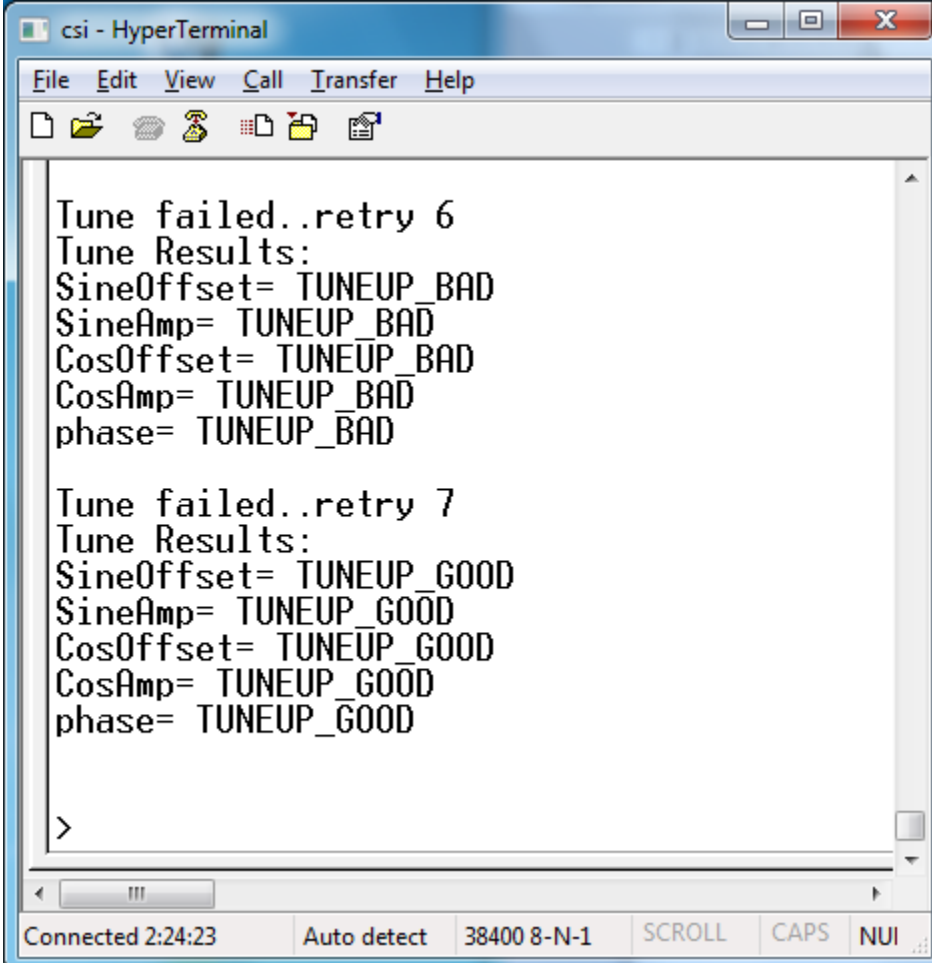

Figure 22. Auto tune with retry example if user aborts with ESC key before the auto tune succeeds (for X axis).

Figure 23. Auto tune with retry example with the tune successful on the 7th retry.

Test Mode Function

The CSI box can be put into "Test Mode" which allows checking of the encoder signal strength/quality. At the factory the encoder signals from the CMM are "tuned" using the "Auto Tune" procedures described in section 4. Over time the encoder signals may degrade slightly, or there might be a problem with the signal integrity on a particular encoder/scale that you want to check. For example the scale may have "smudges" on it (fingerprint, grease, oil) that would adversely affect the data read for the encoder. By placing the CSI in test mode you can check all the encoder signals. **Note that to exit test mode the CSI box has to be powered off.**

Steps for entering and using "Test Mode"

1. Begin with the CMM encoder inputs connected and CSI powered on. Basically it is setup for "normal" operation. PC-DMIS is not required to be running.

2. Enter test mode by pressing and holding the button on the front panel labeled "Test" for > 5 seconds. After you see the LED's on the front panel blink off and then turn RED, release the test button. It will now be in test mode. If you have a Hyperterminal connection (as described earlier is section 5) then you will see this on the screen after holding the button down for >5 seconds.
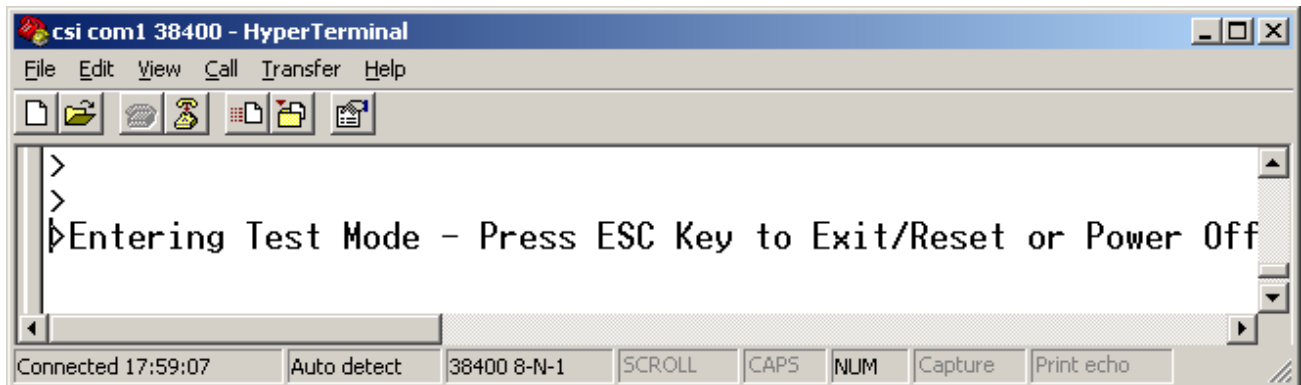
Figure 24. When using the "Test" button to enter test mode, the message above is displayed.

3. At this point the CSI box is in "Test" mode. Now the front panel LED's are constantly updated based on the encoder signal data that it is reading continuously. To test a specific Axis on the CMM, move that Axis and watch the LED color for that Axis. The LED should remain yellow or green through the entire range. For best results the Axis should be moved through its entire range at a constant speed (not too fast preferably). If the movement is

stopped the LED will turn RED because the encoder signal is effectively "flat" when there is no movement. If the LED consistently turns RED at a specific position of the Axis (while moving it), then it could be that there is a "smudge" (dirt, oil, fingerprint, Etc) on the scale. Cleaning it may resolve the problem.   If the LED is RED for most of the range, then it is suggested to do an "Auto Tune" for that Axis as described in section 4 (only need to tune the specific Axis that is having a problem).

4. Exit test mode by powering off the CSI box with the power switch. The CSI will return to normal operation the next time it is powered up. Remember that the next time PC-DMIS is run it is necessary to reset the axes counters since the CSI was powered off.

Initializing CSI to Default State

Typically the only time the CSI box would need to be set to its default state would be if it is going to be used on a new CMM that it has not already been used with. After loading defaults the LED's will all be RED, and the CSI internal EEPROM memory and E2 Pots (E2 Pots are used to "Tune" the Axis input signals) are set to default values. The process to load defaults is as follows:

C A U T I O N
Loading defaults will effectively delete the currently saved tune results/settings from the last auto tune. It will be necessary to perform an auto tune on all 3axes after loading defaults.

1. Begin with the CSI box powered off. It does not have to be connected to anything other than the power supply input. It is ok to load defaults if it is connected to the CMM.

2. Press and hold down both the buttons on the front panel. Flip the power switch on while continuing to hold down the 2 buttons for about 5 seconds. The LED's will blink off and then they will all turn on RED. Release both buttons at the same time once the LED's blink and turn RED. Defaults are now loaded. Note that an "Auto Tune" operation is now required using the CMM that will be used with this CSI box.   See previous section on how to perform the "Auto Tune".

If there is a hyperterminal connection to CSI using the standard PC COM port then you will see the message shown below when defaults are set (this will not be displayed if using the USB COM port because that connection to hyperterminal cannot be active during initial power up due to the "plug and play" nature of the USB COM port). This message is normal when loading defaults.
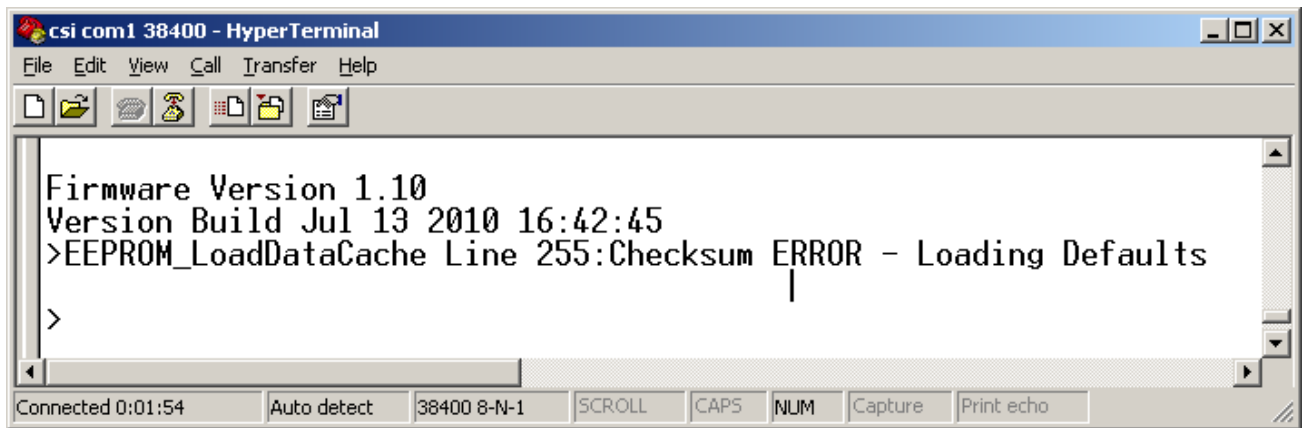

Figure 25. The "Checksum ERROR" message is normal when loading CSI defaults after CSI powers up. It is only displayed at power up if the standard COM port is connected (USB COM port cannot connect during startup so this message would only be observed using standard COM port).

6. Hardware Troubleshooting

This section describes some of the possible errors that may occur when running PC-DMIS with the CSI hardware and provides suggestions on how to resolve the errors. Some of the errors may require service personnel to resolve but others may be resolved by the user.

CSI Hardware Initialize Fails

When starting PC-DMIS and answering "Yes" or "No" to the question: "Should axes counters be reset?" you may get the following error message.
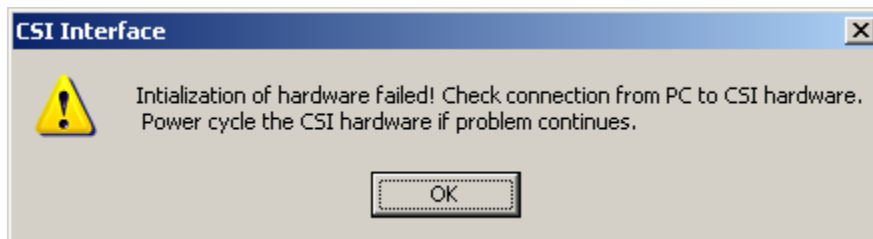

Figure 26. CSI hardware initialization error message

This error may occur for several reasons:

1. The CSI box is powered off

Resolution: Exit PC-DMIS and verify the CSI box is powered on. Restart PC-DMIS with CSI powered on and perform the "Reset Axes.

2. The USB cable between the CSI's "HOST" USB port and the PC is not connected.

Resolution: Exit PC-DMIS, connect the USB cable, restart PC-DMIS. If the axis counters need to be "reset" then answer yes when prompted by PC-DMIS and follow the on screen instructions to complete the reset.(as described previously in this User Guide, the counters only need to be reset if the CSI box had been powered off since the last time they were reset).

3. There is some unknown problem with the CSI hardware or PC USB connection causing a USB communication problem between the PC and the CSI.

Resolution: Exit PC-DMIS and power off the CSI. Also disconnect and re-connect the USB cable attached to the "HOST" port on the CSI box. Power CSI back on and restart PC-DMIS. Answer "yes" when PC-DMIS prompts "Should the axis counters be reset?" and follow the on screen instructions to complete the reset.

"Axis Counters Reset" Fails to Complete

If there is a problem completing the "Axis Counters Reset" when running PC-DMIS, then it will be unable to read the Axis position from the CSI. The failure is evident if when performing an "axis counter reset" you never get the message below after moving all 3 axes away from the "home" position.

Figure 27. Message displayed when "axes reset" completes successfully. If this message does not appear, then there is a problem.

This is unlikely, but several problems may cause this:

1. One or more of the CMM Axis cables are loose or disconnected

Resolution: Verify that all inputs are securely connected and repeat the "reset axes" process as described earlier.

2. One or more of the Axes are not "Tuned" correctly or some electrical "glitch" (static shock, etc) has disrupted the counters

Resolution: Exit PC-DMIS.   First try to power off/on the CSI box, start PC-DMIS and attempt to complete the "axis counters reset" again.   If it fails again, then it is likely that one or more of the CMM Axis inputs are not tuned correctly or the signal from the CMM is bad for some other reason (scale is bad, etc.). You may run the CSI "Test Mode" (see "Advanced CSI Usage" section) to identify which Axis may be causing the problem. If one of the axes is determined to be bad when running "Test Mode", then try to tune that axis. If "Auto Tune" fails (try several times if it fails once) then there is probably something wrong with this axis.   Run the "mechanical adjust" command (see section "CSI Commands" for example) and look at the signal for the specific axis while moving the axis.

"Amplitude Error" when Using PC-DMIS

It is possible that the following error message may be displayed while using PC-DMIS with CSI (it may occur for X, Y, or Z Axis). This is an indication that there is a problem with the encoder signal for the specified Axis. Once this occurs, it may continue to occur until the cause is resolved. The message may immediately be displayed again after clearing the message (by clicking on "ok"). Try moving the axis position away from its current location then clear the message. If it does not occur again then it is likely due to cause #1 in below list.
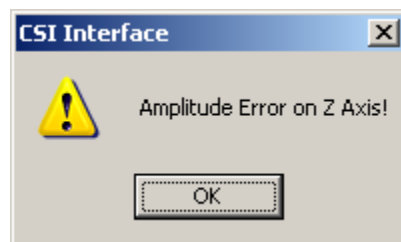

Figure 28. Amplitude error message indicating an error condition that needs to be addressed.

Several problems may cause this error message to occur

1. If this error only occurs when the Axis is moved through the same position/range, then it could be due to a dirty scale (fingerprint, oil, grease, etc).

Resolution: Clean the scale at the position where the error message is occurring

2. An electrical glitch may have disrupted the counter hardware

Resolution: Exit PC-DMIS and power off the CSI. Power CSI back on and start PC-DMIS. Reset the axes counters and use PC-DMIS normally. If the error message does not occur again then the problem is resolved. If still getting the error message then it may be due to problem #3 described below.

3. The encoder for this Axis may need to be re-tuned.

Resolution: Run CSI "Test Mode" for the axis in question. If the RED LED is on for most of the range of motion of the Axis (indicating the signal is bad/out of tolerance), then it should be tuned using the "Auto Tune" procedure described in section 4.

Appendix A – Full CSI Command Listing

Using the "help" command a full list of supported commands is displayed. Most are not used by end user or service personnel and should not be used unless debugging some problem.

>h

Help:

 ax,ay,az,aw (Axis Read)

   Reads one A/D sample for the Cosine and Sine signals

 axr,ayr,azr,awr (Axis Read Reference)

   Verifies that the reference voltage input for the specified axis is correct. It should always read 127 or 128

 cx,cy,cz,cw (Coarse Tune Axis)

   Perform a coarse tune of the offset and amplitude for the specified Axis.

 ds/dg/df (Debug Level and Zone Set/Get)

   ds <level><zone mask>

   df Displays list of available Zones

 er/ew/ec/ep/et/erb/erw/erd/ewb,eww,ewd,ei (EEPROM Read,Write,etc)

   er <optional start addr> Reads 512 bytes of EEPROM

   erb/erw/erd <addr> Reads a byte,word or dword

   ewb/eww/ewd <addr> <data> Writes a byte,word or dword

   ec Updates checksum

   ep Reads saved pot values

   et Reads saved tune results

   ei Invalidate EEPROM checksum

 gx,gy,gz,gw (Get Axis data)

   This differs from the ax/ay/az/aw commands in that it reads many samples

   (250 at the moment) for the given axis and determines the max, min,

   amplitude and offset of the signal.

 gp (Get Phase Error)

 lc,lx,ly,lz,lw (LED Set)

   Writes the value passed as a parameter to the LED: lx <data>

   Valid values are 0-7

mx,my,mz,mw (Mechanical Adjustment Of Scale)

   This will display a graphical representation of the sine and cosine signals.

   It updates continuously until exited with ESC key.

pr,pw,pi (E2 Pot Read/Write/Increment)

   pr Reads all registers of the E2 pot chip passed as parameter

   pr <chip> (chip is 0-8)

   pw Writes byte value to the specified E2 pot register

    pw <chip> <pot|register> <data>

    Example to write 0x77 to register 4 of pot 1 on chip 0:

    pw 0 14 77

   pi Increment the E2 pot wiper register by the specified value

   pi <chip> <pot> <incr value>

r (Reset the CSI board using WDT)

sp (Save Pot Values to EEPROM)

   Writes the current pot values for all Axes to EEPROM.

ta,tx,ty,tz,tw (Auto Tune Axis)

   Initiate an Auto tune for the specified Axis. TA will tune all Axes

   (excluding W). The Axis must be moving when the command is executed

(Note the following command is only available in firmware version 1.30 or greater)

txr,tyr,tzr,twr (Auto Tune Axis with retry)

   Initiate an Auto tune for the specified Axis. These commands will continually retry

   auto tune until it passes or the user presses ESC key to abort.

tm (Test Menu)

   This command is used for manufacture testing of hardware

trx,try,trz,trw (Tune Results for Axis)

   This command will read many samples for the Axis and determines

   tune results based on the samples. It does NOT read the last

   tune results saved to EEPROM

v (Version Info)

   Displays firmware version and build date

we,wd,wi,wc (Watchdog Timer Enable/Disable/Info/Clear)

 wi - Reads the number of times the WDT expired from EEPROM

  wc - Clears the number of times the WDT expired in EEPROM

Appendix B – PC-DMIS Configuration Settings related to CSI

There are a few PC-DMIS settings accessible via the PC-DMIS "Settings Editor" that are applicable to configuration for use with CSI hardware. Most important are the "StretchX", "StretchY", and "StretchZ" settings under the "Tech80_Interface" (see below). For Brown and Sharpe encoders these should be set to 25000 and for TESA encoders these are set to 40000. For TTL encoders the value is 200000. These should be set by service technicians during initial setup.
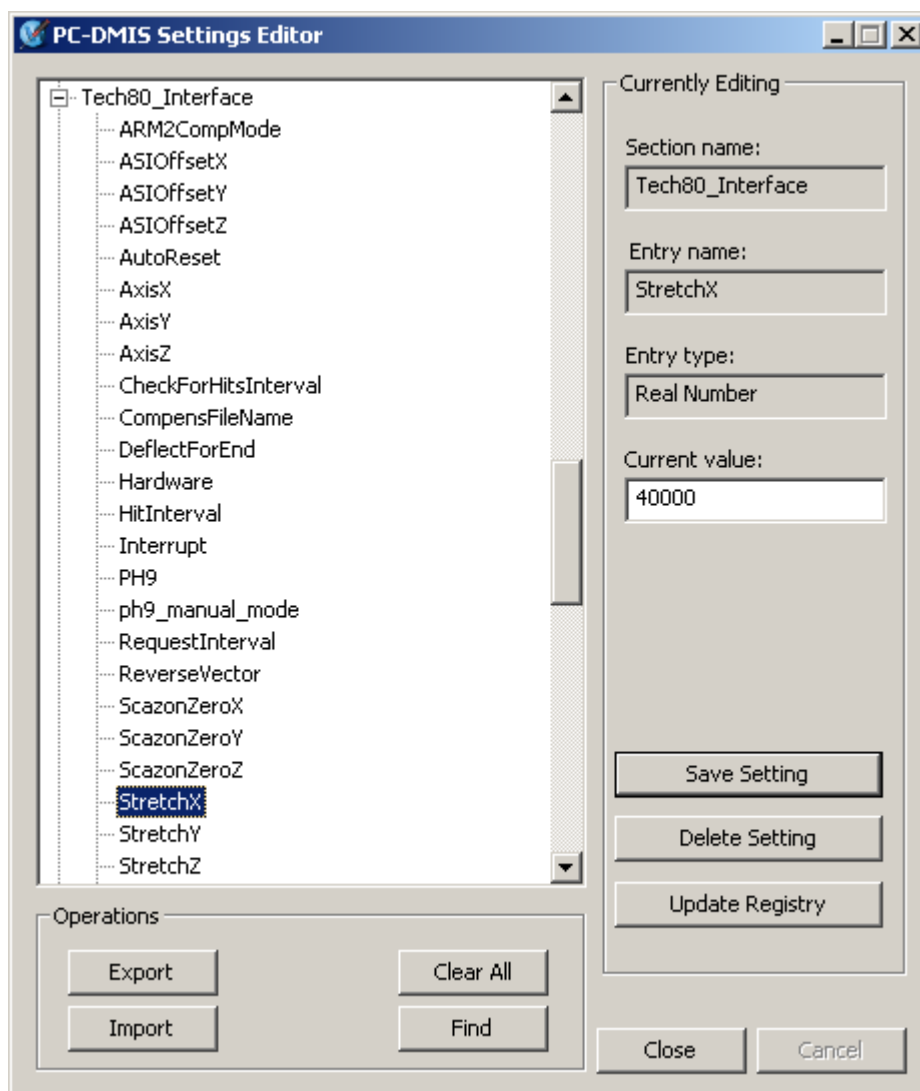
The only other setting that is specific to using CSI (actually this is also the same when using the XnPCI card that CSI is replacing) is the "Hardware" value under Tech80_Interface. It MUST be set for "B". The installer for the CSI interface will attempt to set this to "B". However if PC-DMIS has never run with the "Tech80" interface selected (prior to installing CSI interface software), then when it does run it will initialize all the registry entries and overwrite this setting.
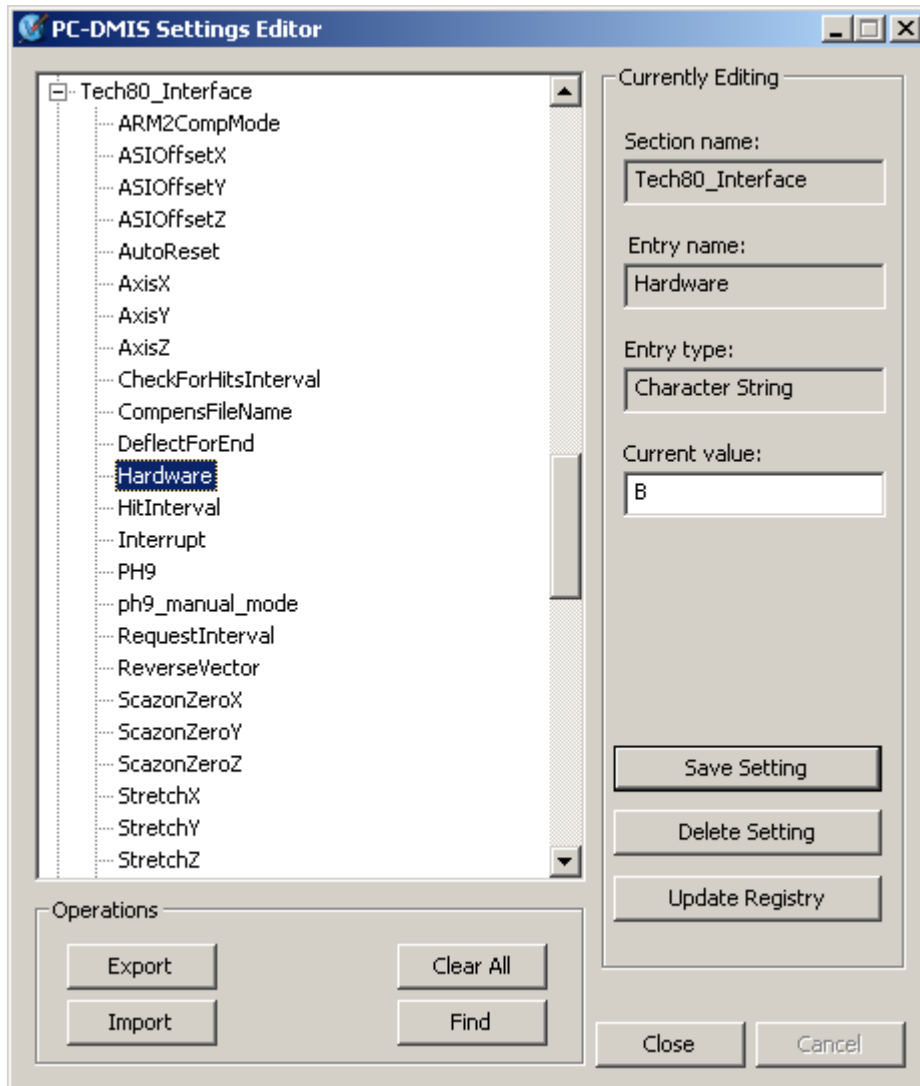
Appendix C – Changing Mouse Speaker Beep Volume

The mouse speaker volume, frequency, and duration are set to default values that should be reasonable in most environments. However, if the end user wants to change the volume the following Windows registry values maybe be changed. PC-DMIS must be exited and restarted for the changes to take effect. The maximum volume setting is 40 (decimal). In below example the value is set for the default (HKCU\Software\Hexagon\CSI).