1. PEDESTAL ENCODERS INTEGRATION

1.1 Introduction

When the pedestal is in assembly phase or replacement of encoder unit is required, it is necessary to carry out a special process for the integration and set up of the unit within the pedestal hardware environment.

The principle of the encoder integration is done by connection of the unit through a bidirectional serial protocol interface for easy access to the absolute position and for setup parameters via RS-422.

This procedure is to be applied whenever such event takes place. The software tools provide a set of tools for testing, integration, mounting aid and calibration of the electric encoder.

This specification contains the following procedures:

1. **Encoder Calibration Initial Conditions**.
2. **Azimuth Encoder Zeroing**.
3. **Elevation Encoder Zeroing**.
4. **Azimuth Motor Phasing Procedure**.
5. **Elevation Motor Phasing Procedure**.
6. **CONTROLLER REPLACEMENT**.

1.2 Encoder Calibration Initial Conditions

The encoder calibration is carried out in the Azimuth or Elevation structure assembly operation when the encoder is mounted and before continuation in the pedestal assembly carrying out.

The basic principal connection of the test setup is illustrated as follows:

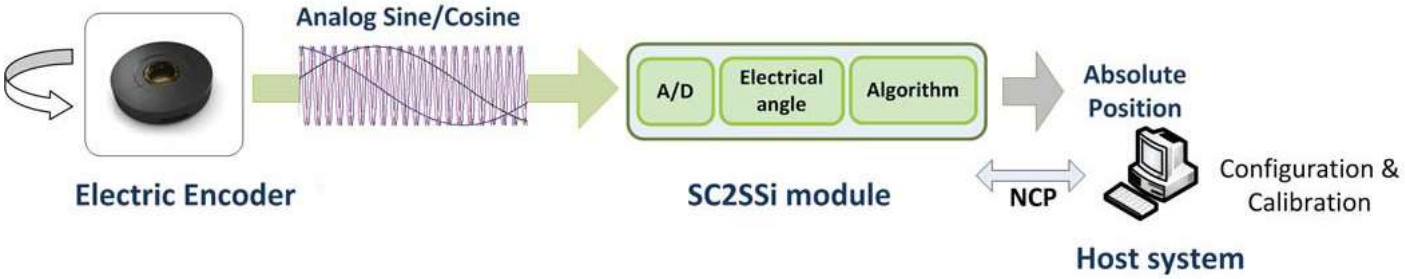


Figure 1-1. Encoder Test Connection – Principal Diagram

Figure 1-2. Encoder Principal Connection for Test

1.3 Preparation for Test

a. Apply the pedestal for encoder's calibration as follows:

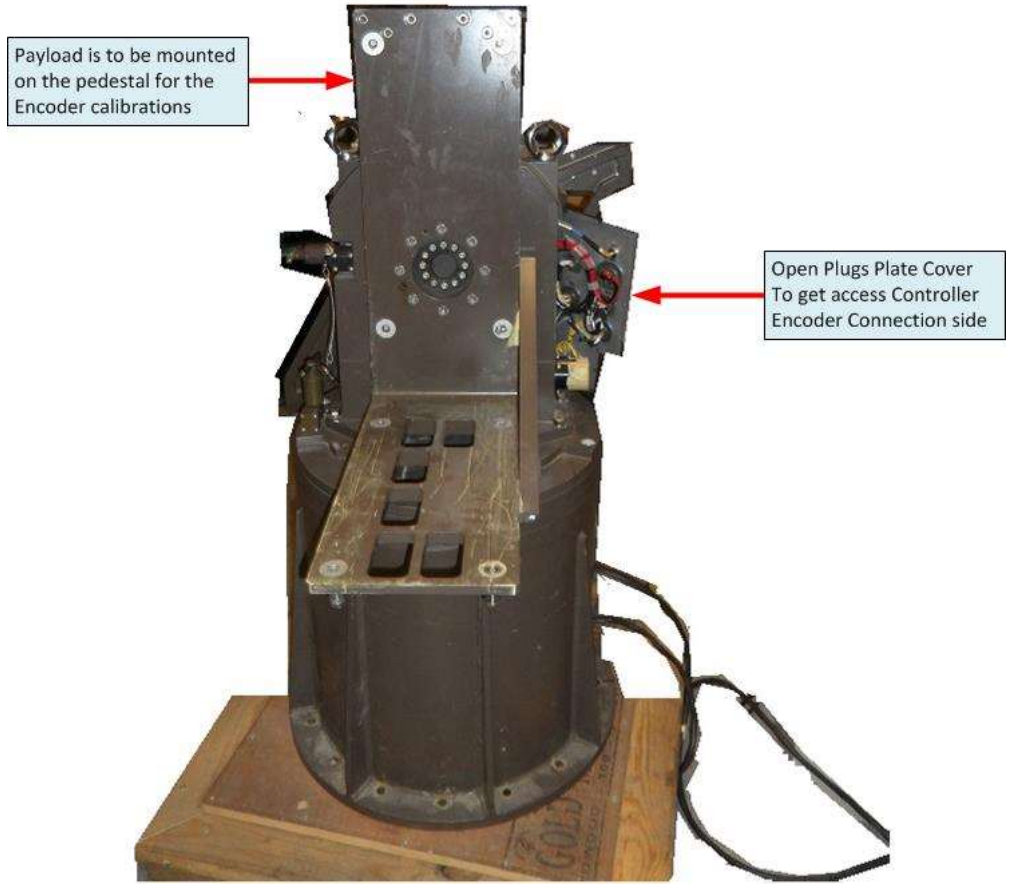


Figure 1-3. Pedestal Formation for Encoder Calibration

b. Open elevation support cover in lockers side:

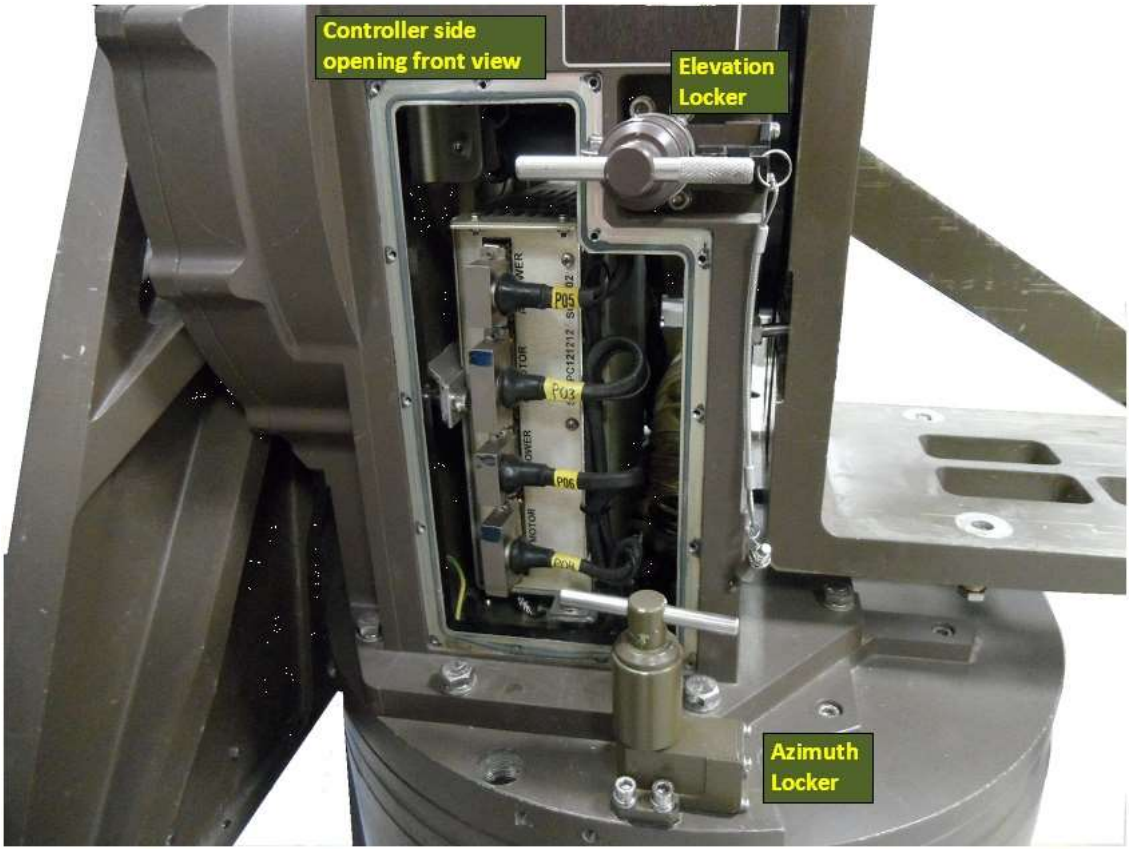


Figure 1-4. Encoder Calibration – Controller Side Front Opening

c. Connect the special test cable between the pedestal and the STE as follows:

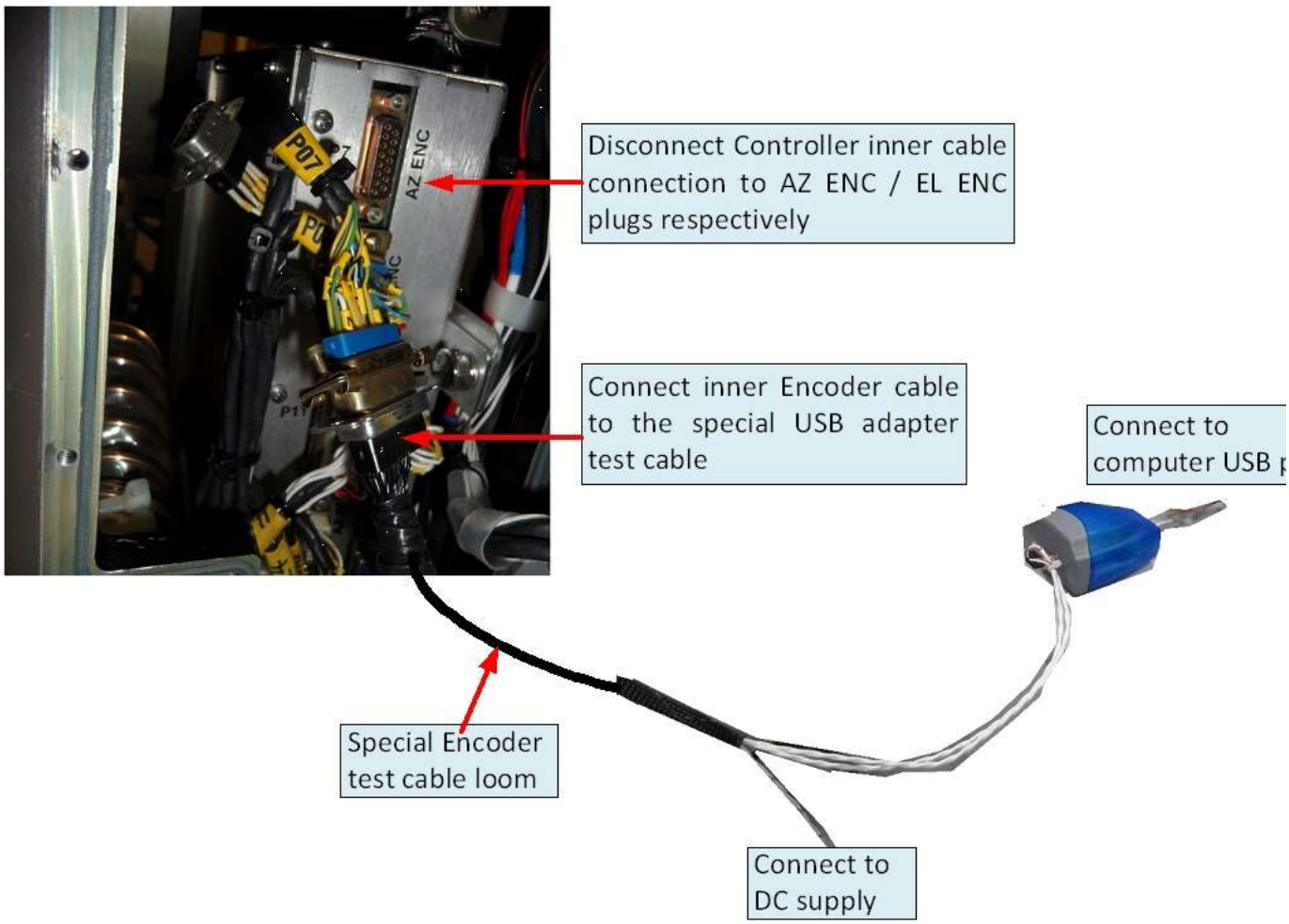


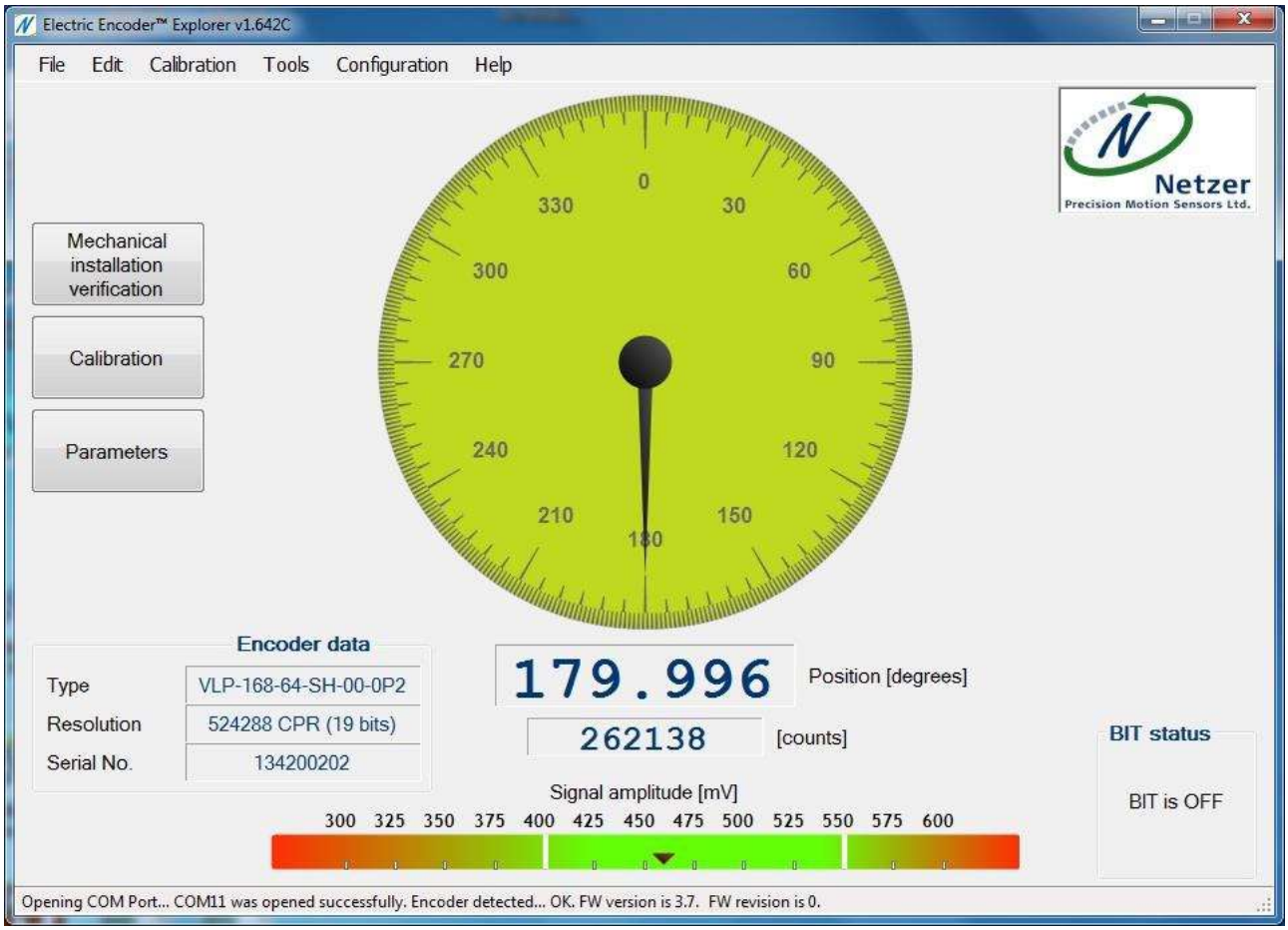
Figure 1-5. Encoder Connection for Calibration

d. Connect the Azimuth encoder plug to the Adapter and the adapter USB plug to the STE computer USB port and the DC splitting loom to the external DC supply.

NOTE:
Now the calibration circuitry is ready to switch ON supplies

e. Switch ON the STE, in completion of computer start up identify the **Electric Encoder Explorer** application icon:

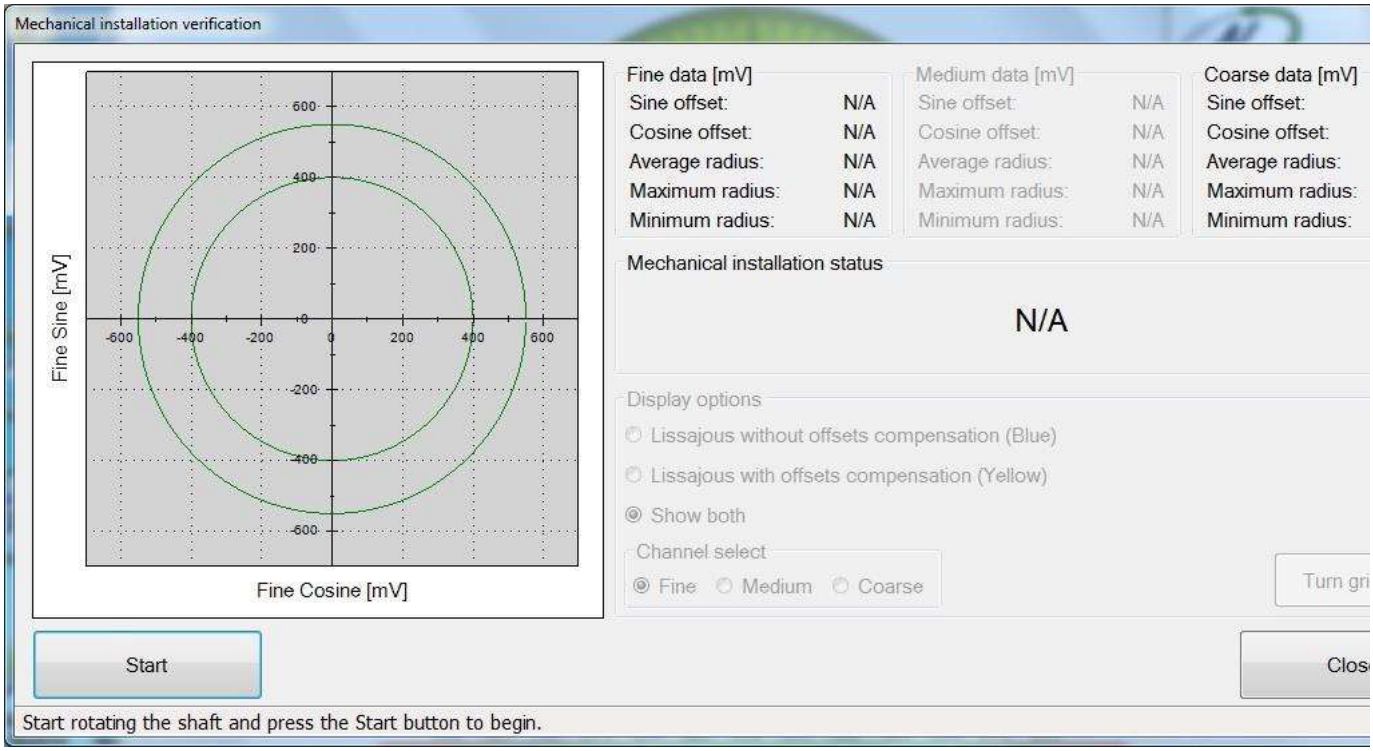
f. Start the application and verify the following opening screen display:



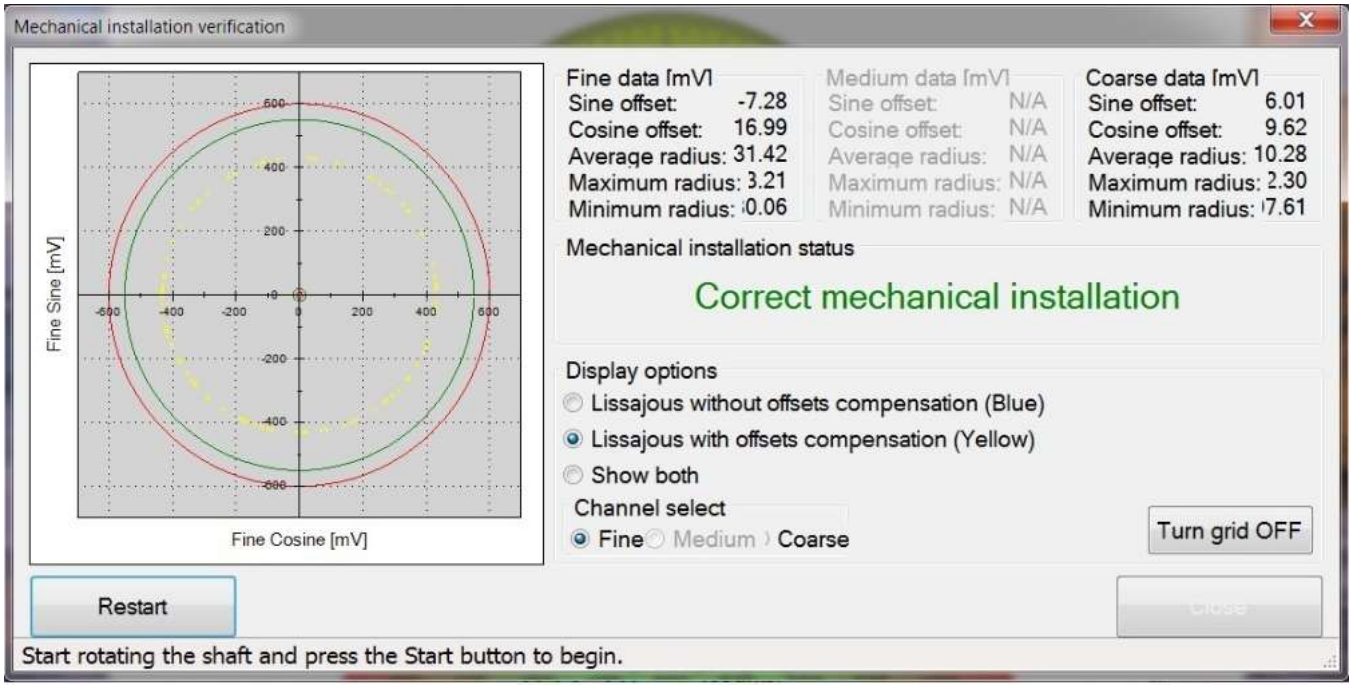
NOTE:
Note the position of the ***"Signal amplitude"*** notch: Best position is in range of 425 - 550
In case of readout >500 – place shims as required on Encoder Stator part
In case of readout <400 – place shims as required on Encoder Rotor part

1.4 Azimuth Encoder Zeroing

a. Key in the button ***Mechanical Installation*** and verify the following screen display:



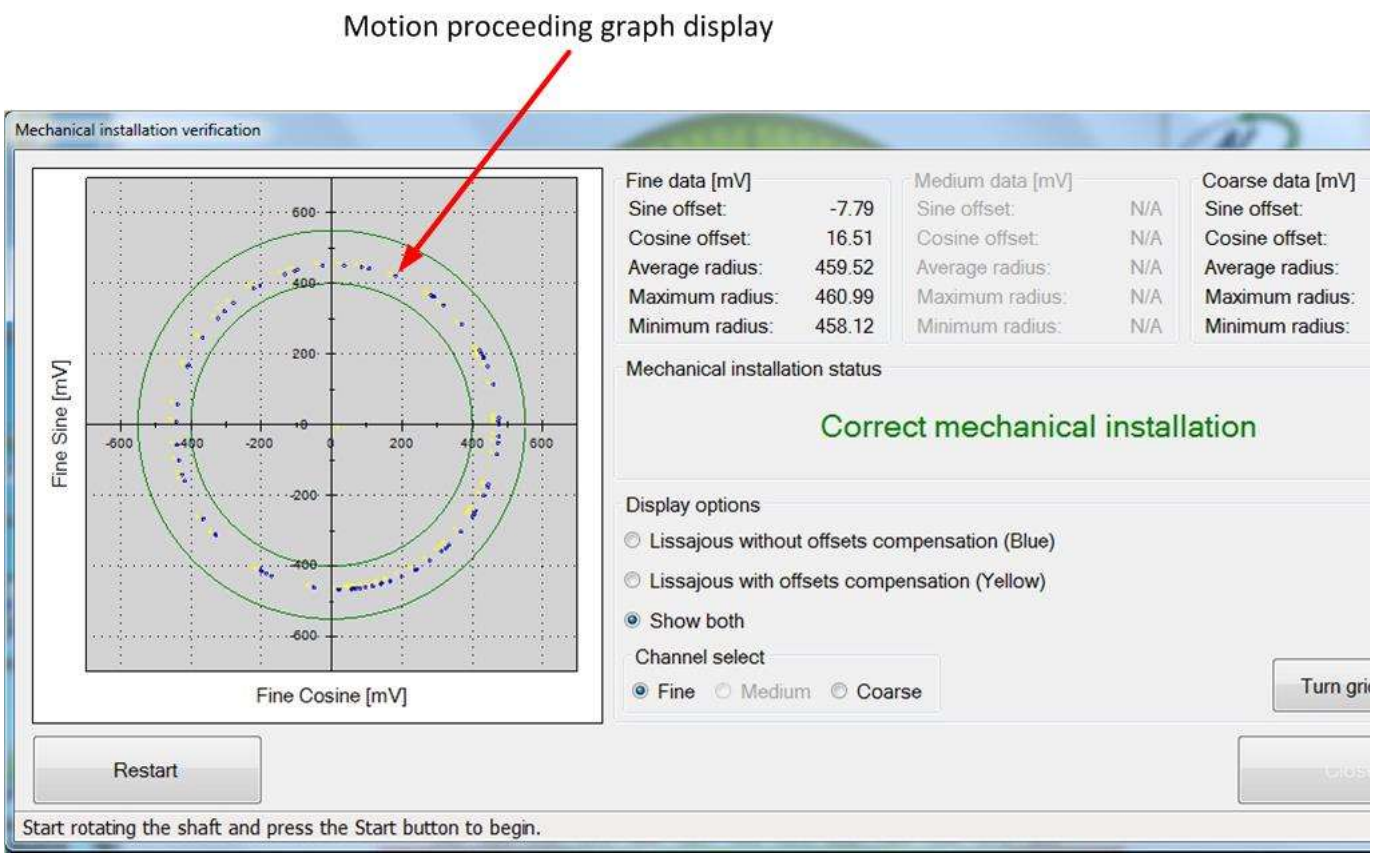
b. Key in the ***Start*** button – verify the following form display:



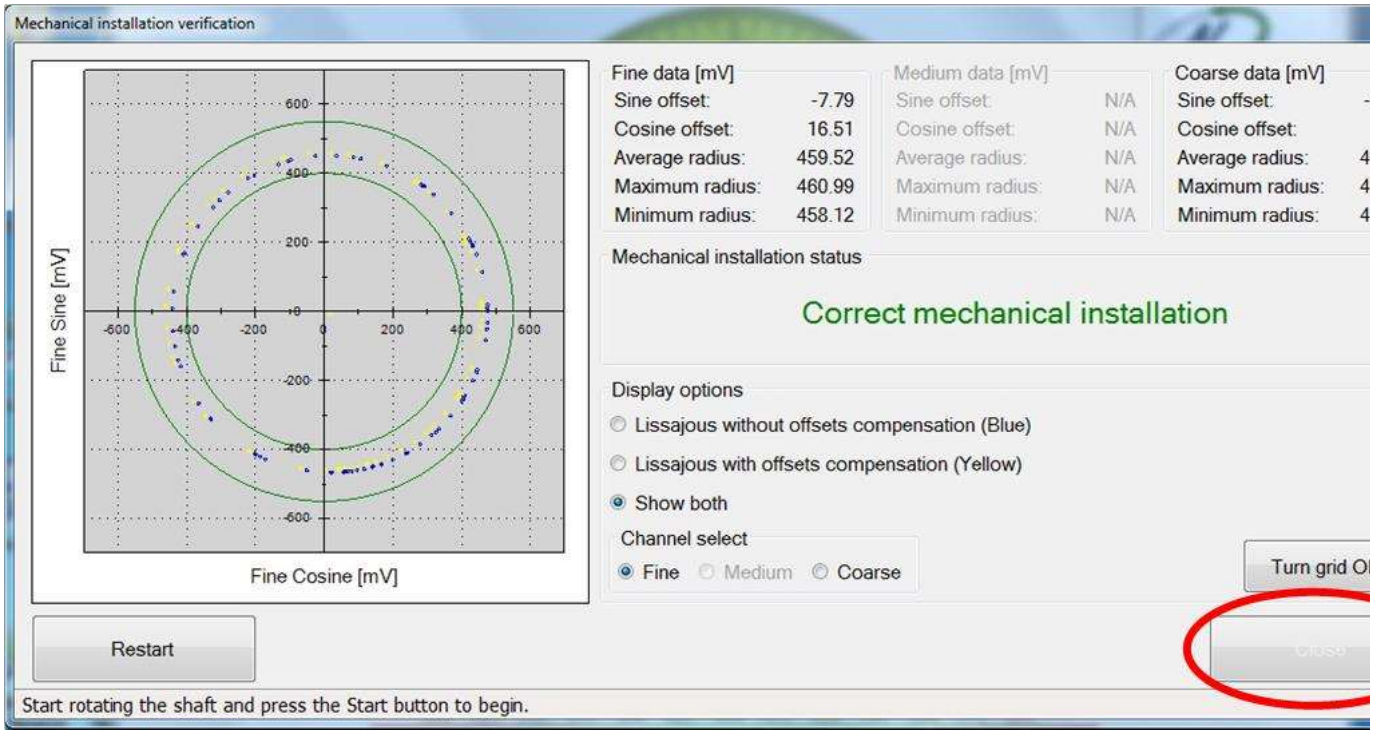
Select in the **Display options** frame the ***"Show Both"*** radio button

Verify the following:

Rotate manually the Azimuth axis until the string **"Correct mechanical installation"** is displayed, and complete circle is illustrated in the left board (non distorted circle).

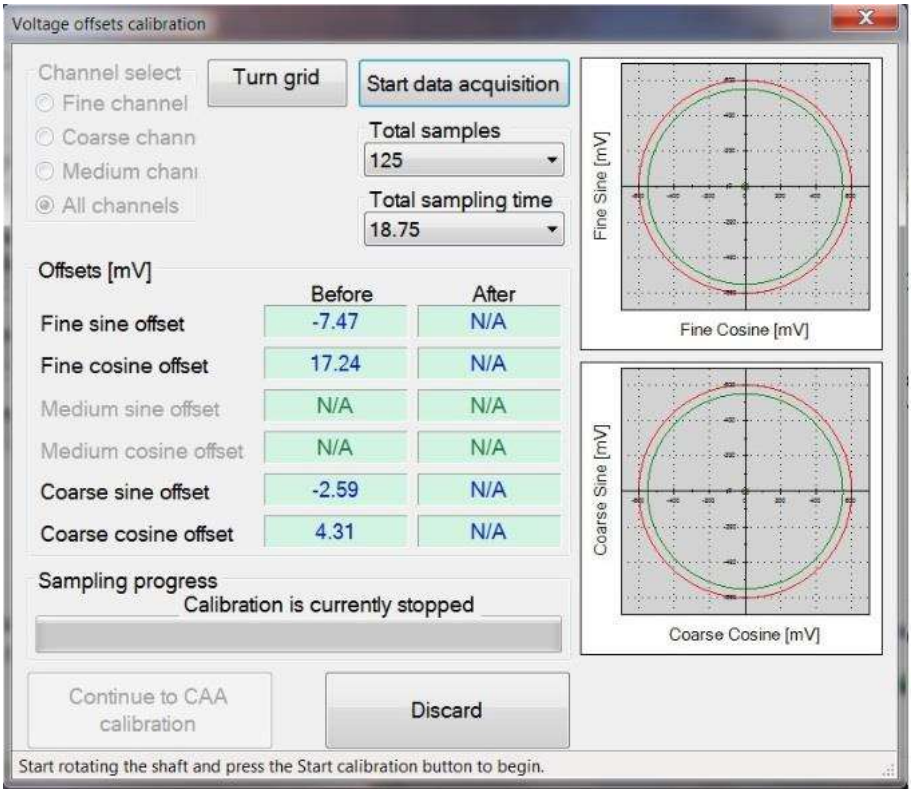


c. Verify button ***Close*** flickers, key in the button, close the form and verify the main opening screen display



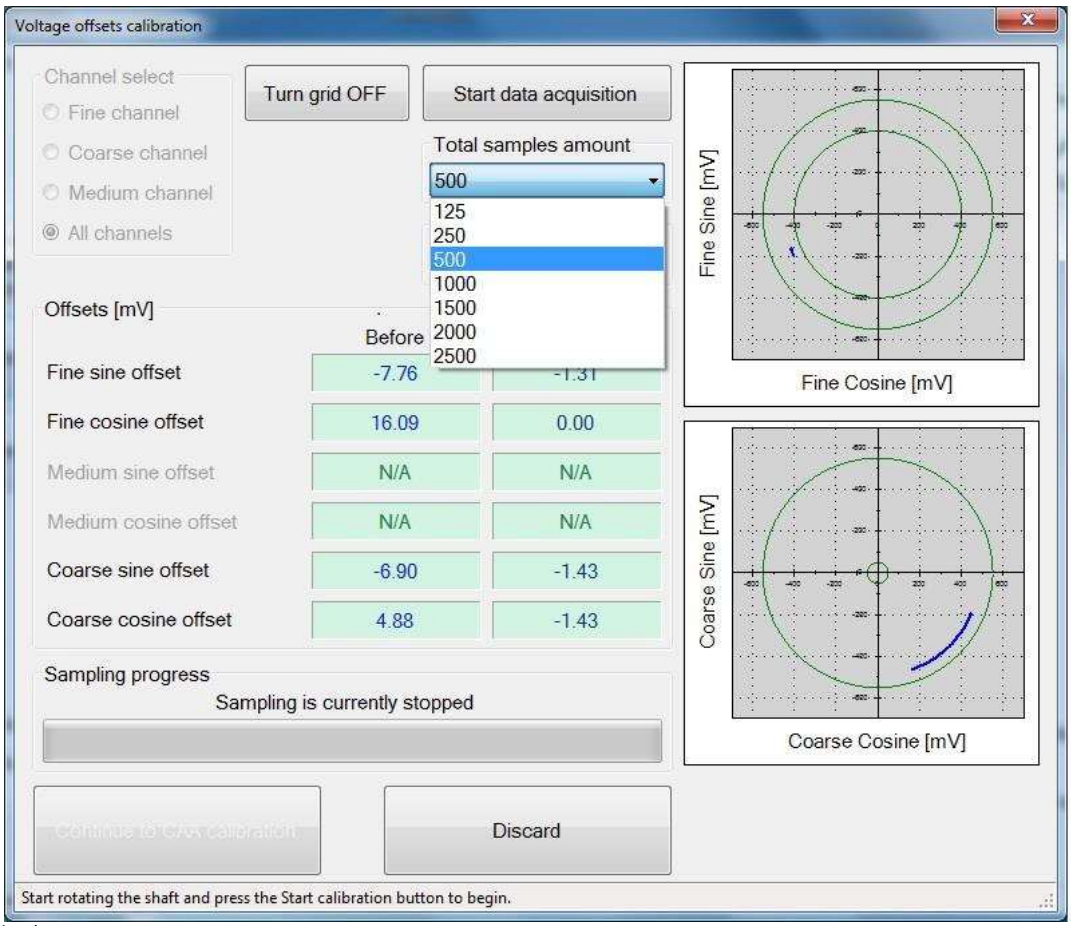
d. Key in the button ***Calibration***

e. Verify the voltage offsets calibration form is displayed:



Notify the following:

1. Verify button ***Start data acquisition*** flickering
2. Open the Combo **"Total samples amount"** and select the value 500 as follows:



3. Do the following:

   i. Manually rotate the Azimuth axis fully 360º in CW direction, then fully 360º in CCW direction.

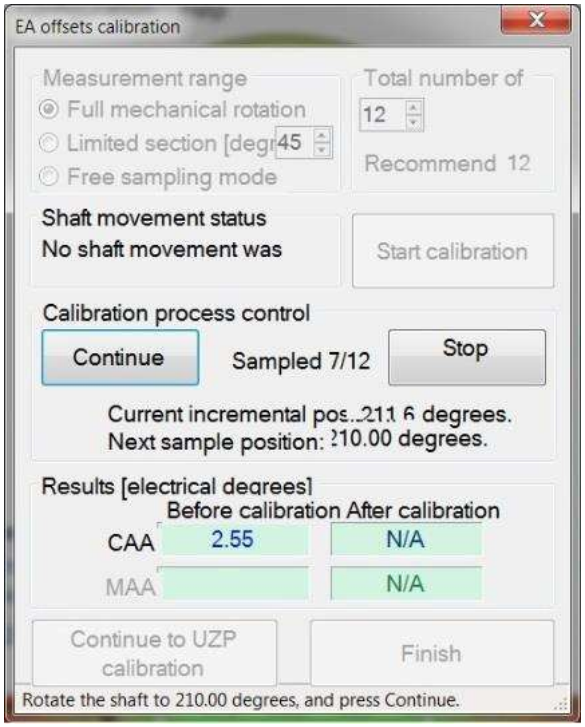
ii. Verify progress of process in the **"Sampling progress"** ruler twice - until the button ***Continue to CAA calibration*** flickers

iii. Note the graph creation during motion in the two windows as specified in the following figure:

iv. Verify in the **"Offset[mV]"** frame the **"After"** column 4 text boxes values displayed flickering

NOTE:
In case the test drill is completed not satisfactory – then repeat the process by keying the button ***Discard*** followed by press on ***Calib*** button.

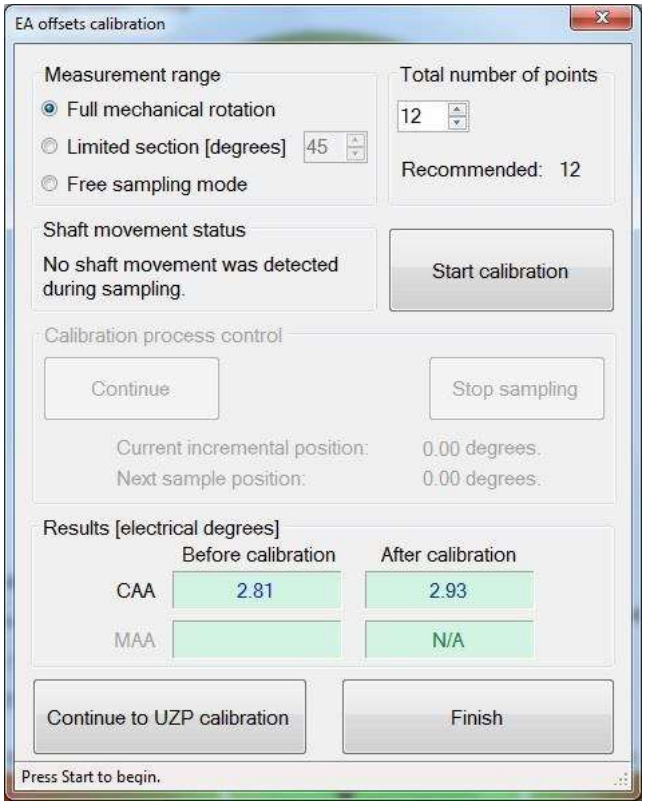
f. Key in the button ***Continue to CAA calibration*** – the EA offsets calibration form is displayed:



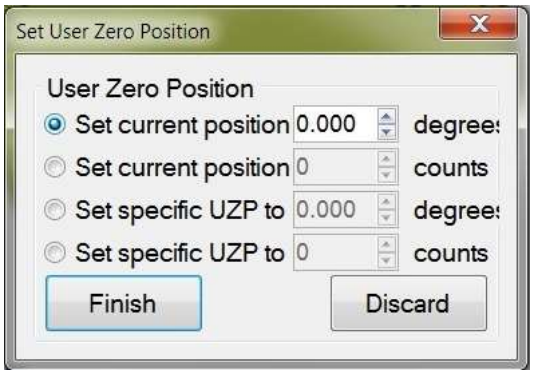
Notify the following:

1. Verify button ***Start calibration*** flickering
2. Do the following:
   i. Manually rotate the Azimuth axis to shift a sector of 30º until the button ***Continue*** flickers.
   ii. At this position – place the mouse symbol on the ***Continue*** button followed by key in the mouse left button to insert the readout
   iii. Verify increments in the “Sampled” counter readout for each sector completion
   iv. Repeat step (i) throughout all the Azimuth range (12 sectors)

g. In completion of shaft rotating – verify the following screen display:



h. Key in the button ***Continue to UZP calibration*** and verify the Zero Position form display:

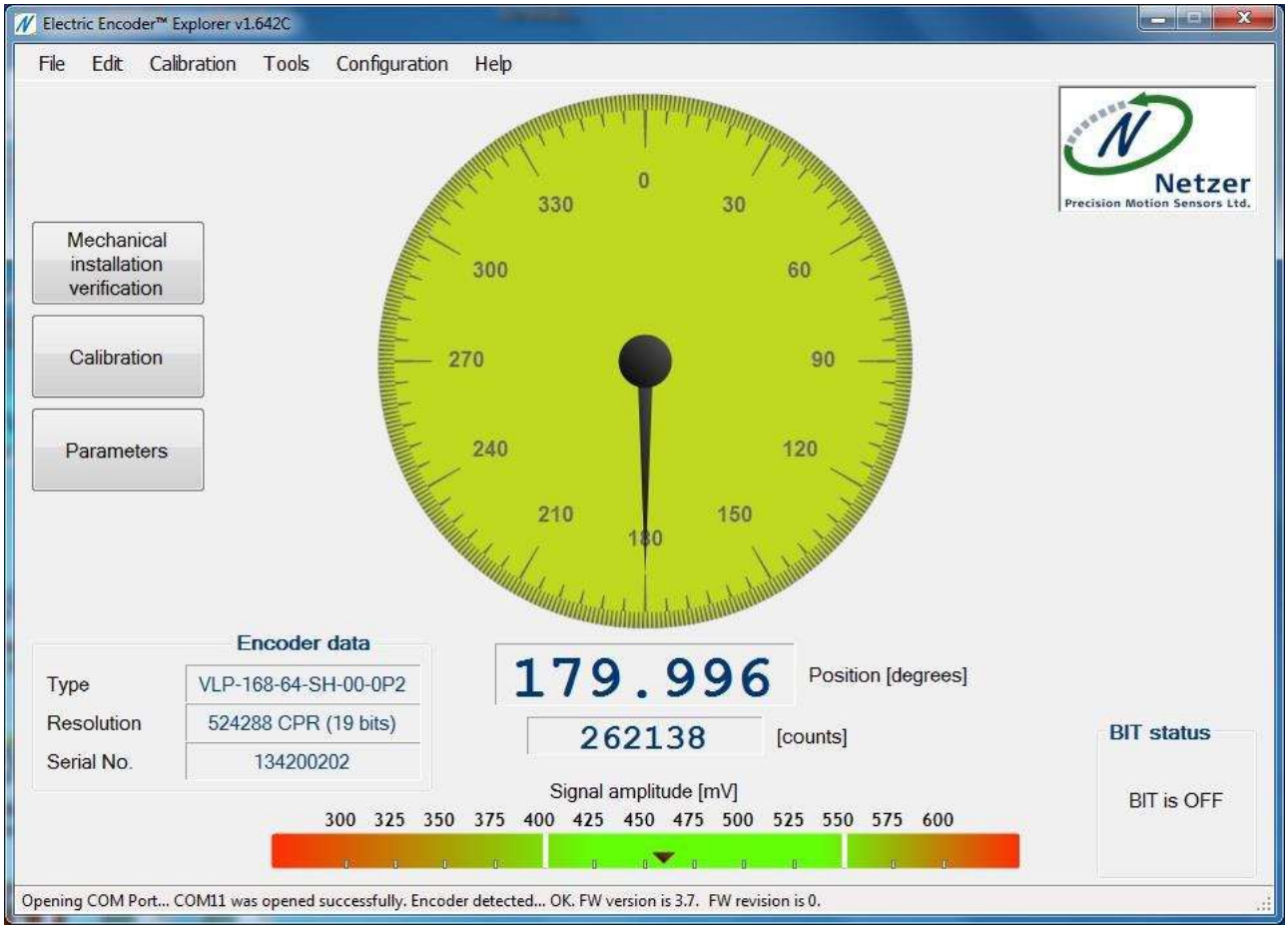


Do the following:

i. Bring the Azimuth axis shaft to the 180º notch marker, insert the Azimuth locker and ensure lock

ii. Edit in the **"Set current position"** text box: 180 [degrees]

iii. Key in the button ***Finish*** and verify the following screen display:



iv. At this stage the encoder zeroing process is complete, but repeatability check is required to end the calibration.

v. Go out from the application, disconnect the USB adapter, rotate the Azimuth shaft to any randomly position

vi. Reconnect the USB adapter, start the Electric Encoder Explorer application again.

vii. Verify in the angle display the present position, set to 180º position and ensure readout display of 180 respectively

End of process.

1.5 Elevation Encoder Zeroing

1.5.1 Preparations for Zeroing Procedure

The procedure will be carried out in the following initial conditions:

a. Elevation support is to be assembled on the Azimuth support movable plane

b. All cabling is routed properly on plane surface (As specified in Figure 1-5)

c. Elevation locker installed and position it in UNLOCK state (See Figure 1-6)

d. Connection of Encoder USB adapter to computer side and Elevation encoder cable plug (P08) (As specified in Figure 1-5)

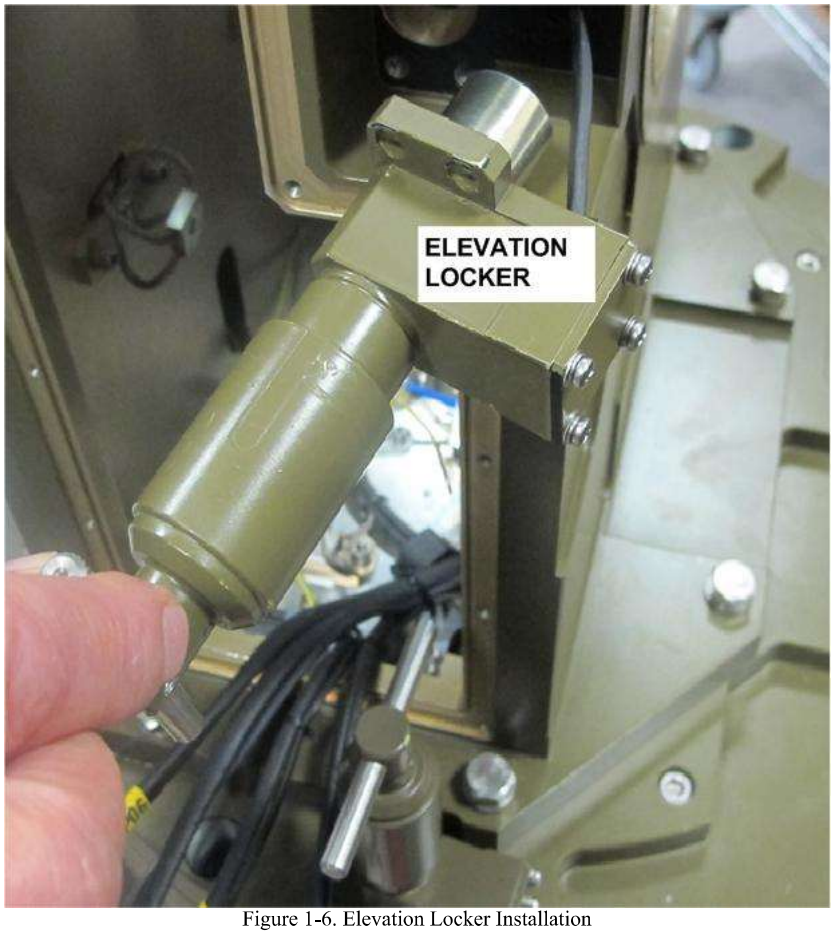


Figure 1-6. Elevation Locker Installation

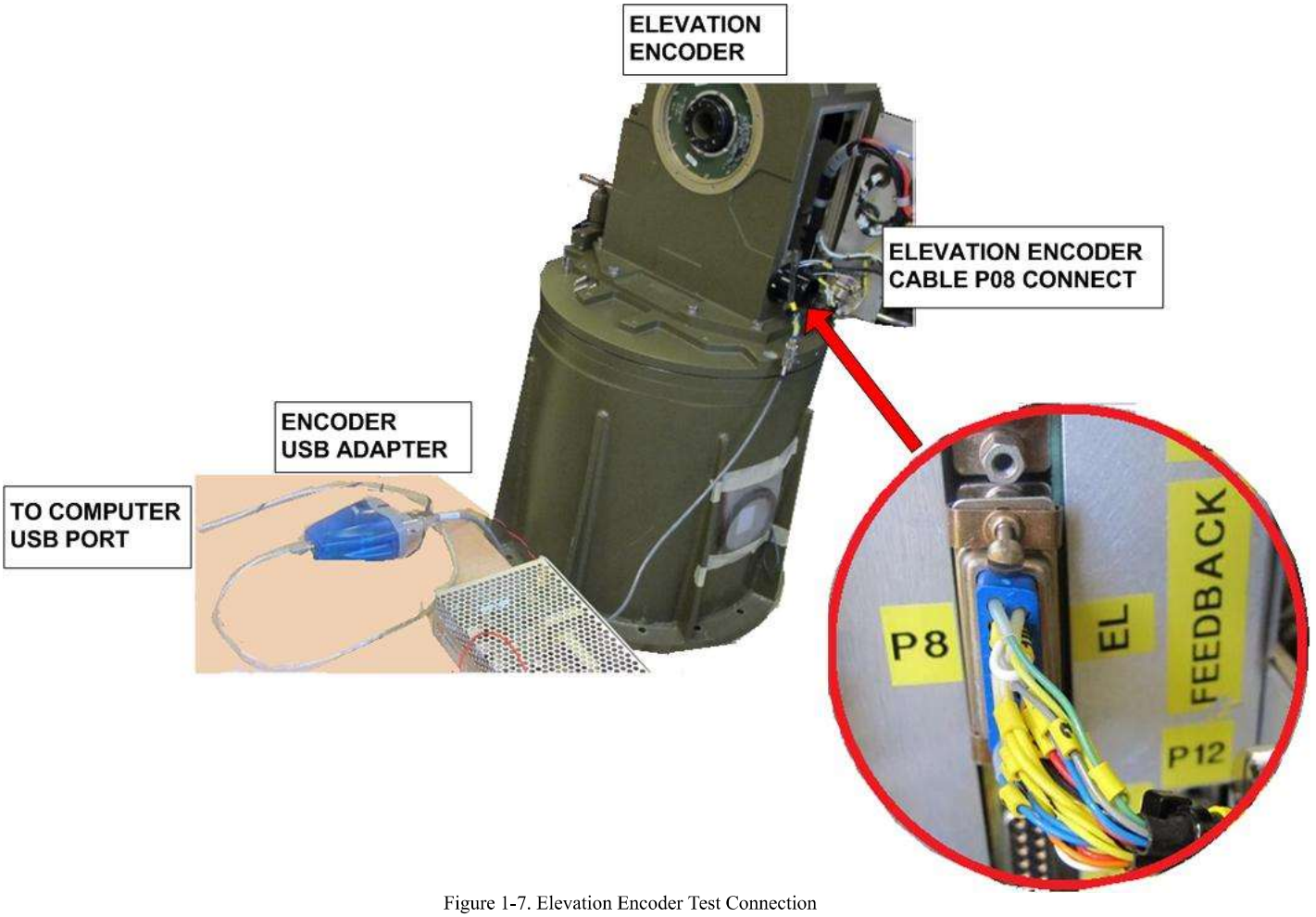
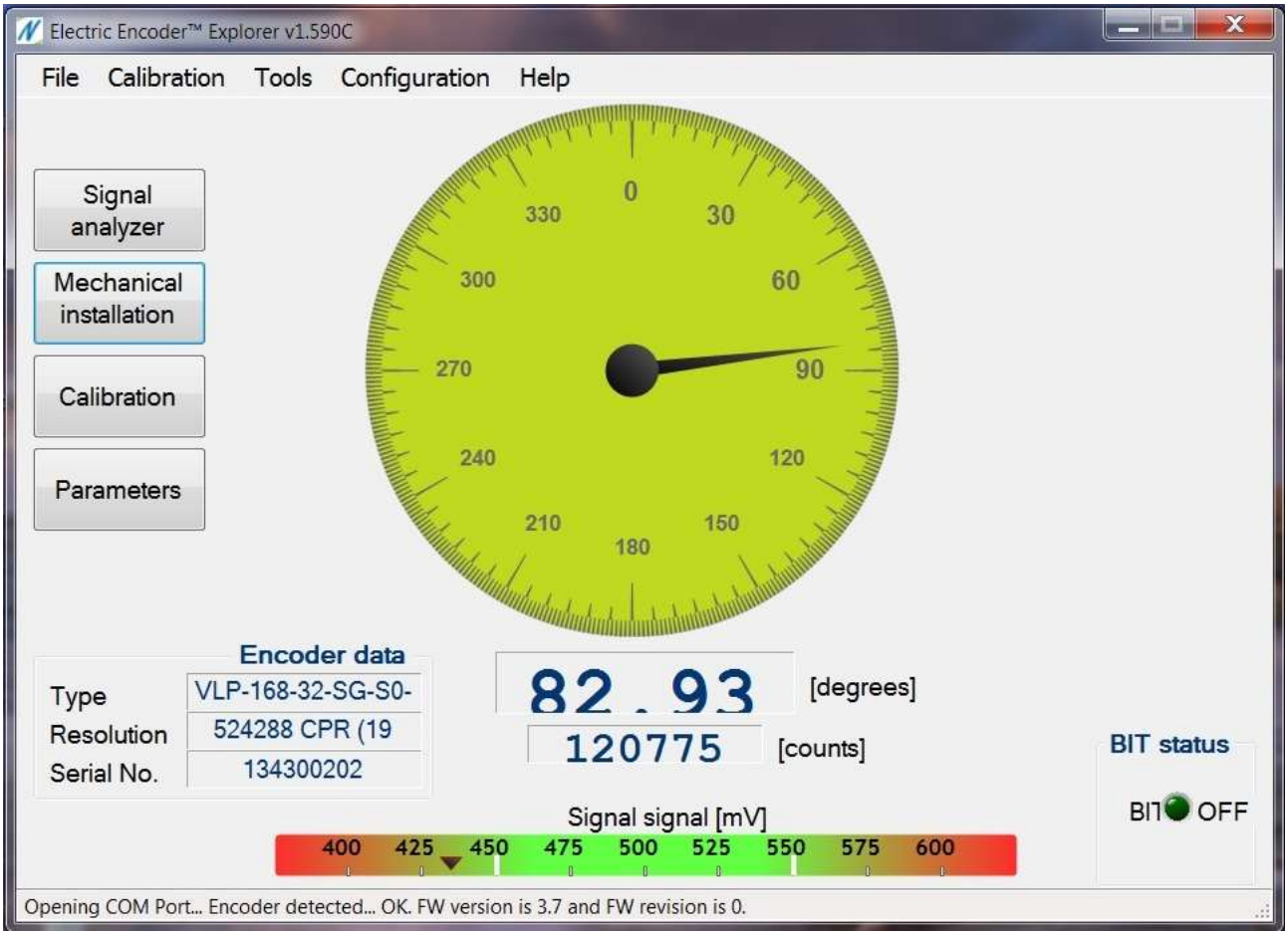


Figure 1-7. Elevation Encoder Test Connection

1.5.2 Elevation Zeroing Procedure

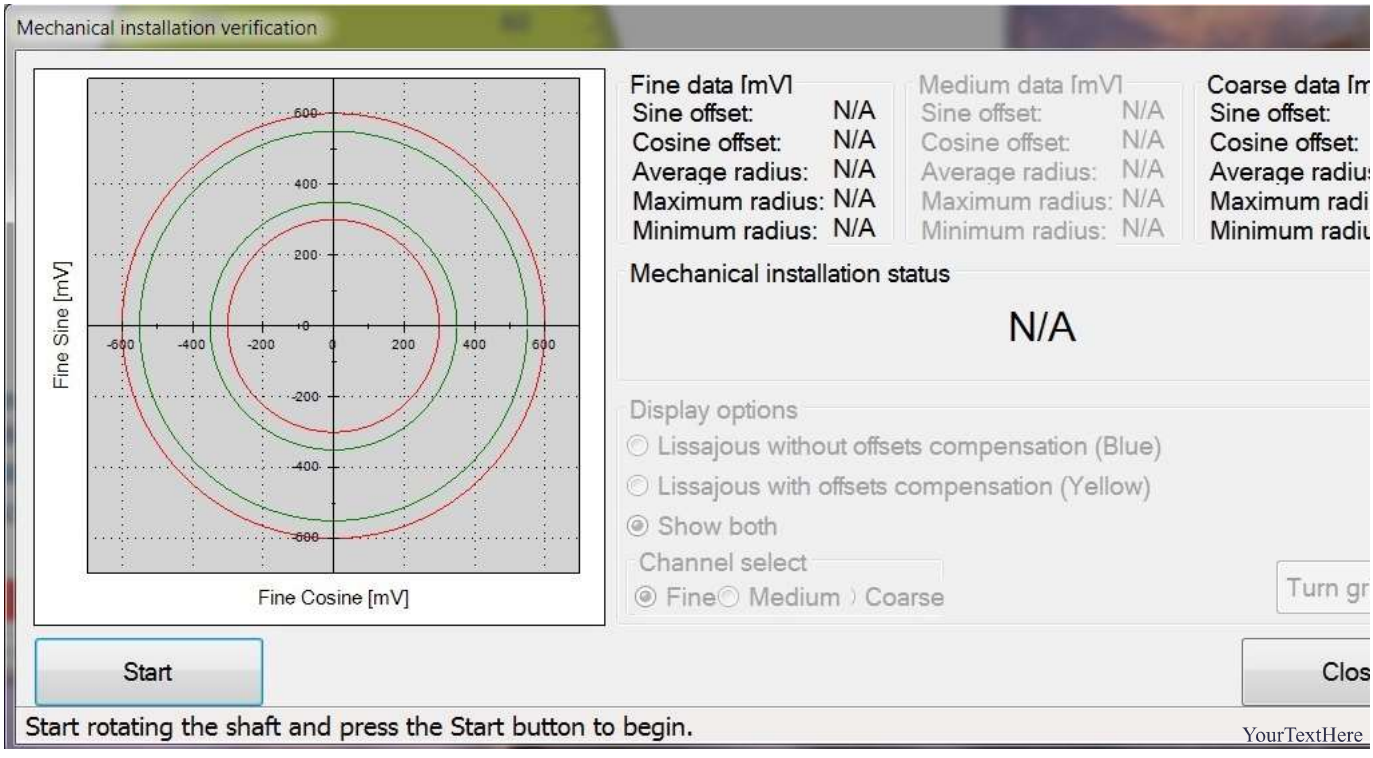
a. Switch ON the STE, in completion of computer start up identify the **Electric Encoder Explorer** application icon:

b. Start the application and verify the following opening screen display:

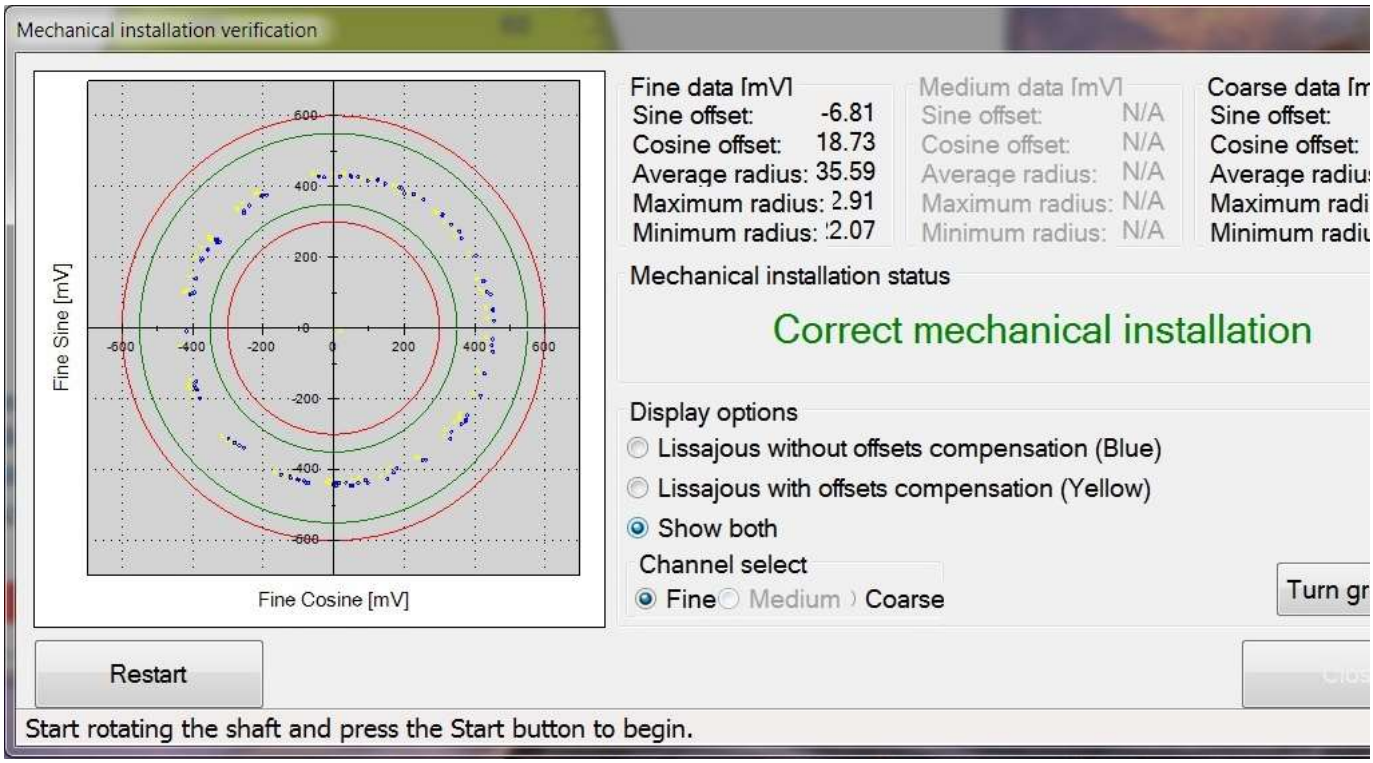


NOTE:
Note the position of the ***"Signal amplitude"*** notch: Best position is in range of 425 - 550
In case of readout >500 – place shims as required on Encoder Stator part
In case of readout <400 – place shims as required on Encoder Rotor part

c. Key in the button ***Mechanical installation*** and verify the following screen display:

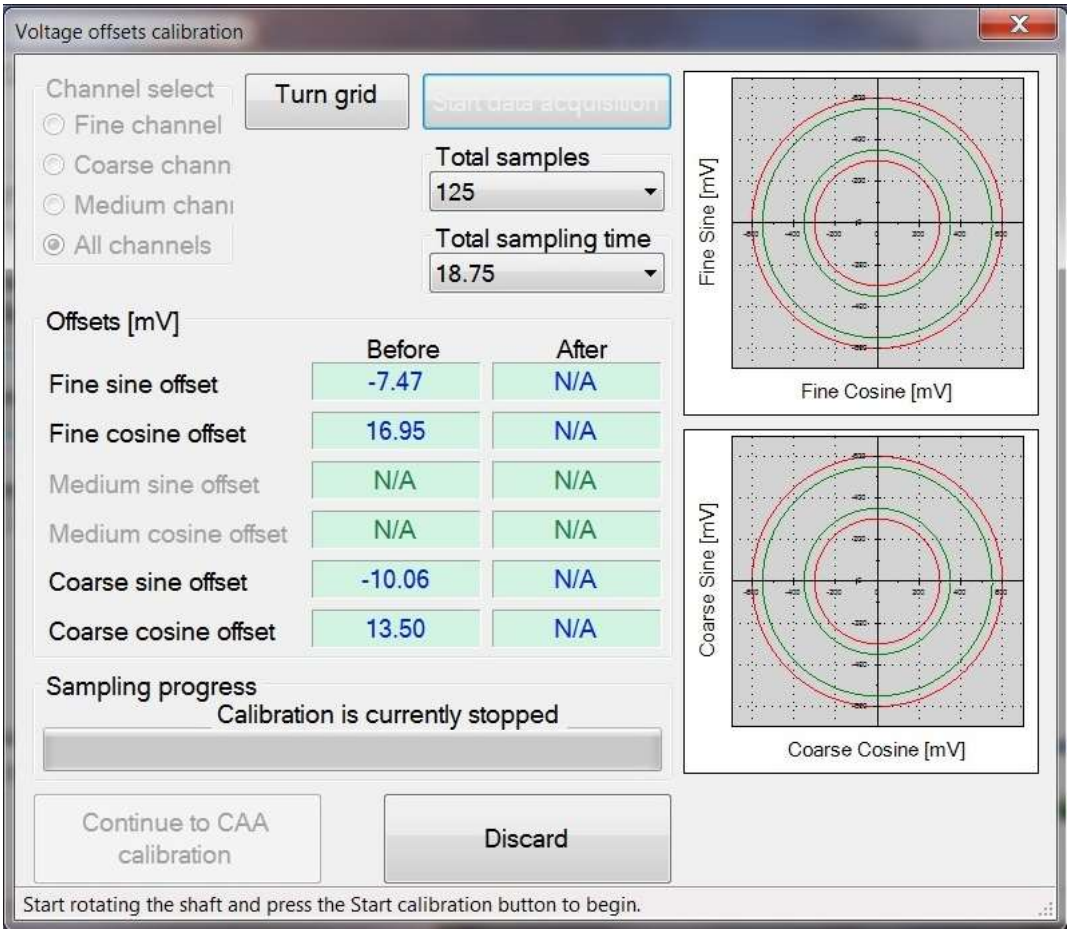


d. Verify button ***Start*** flickers, key in the button and rotate the elevation shaft manually to any direction until the string **"Correct mechanical installation"** is displayed as follows:



e. Verify button ***Close*** flickers, key in the button and verify the main screen display

f. Key in the button ***Calibration*** and verify – the voltage offsets calibration form is displayed:



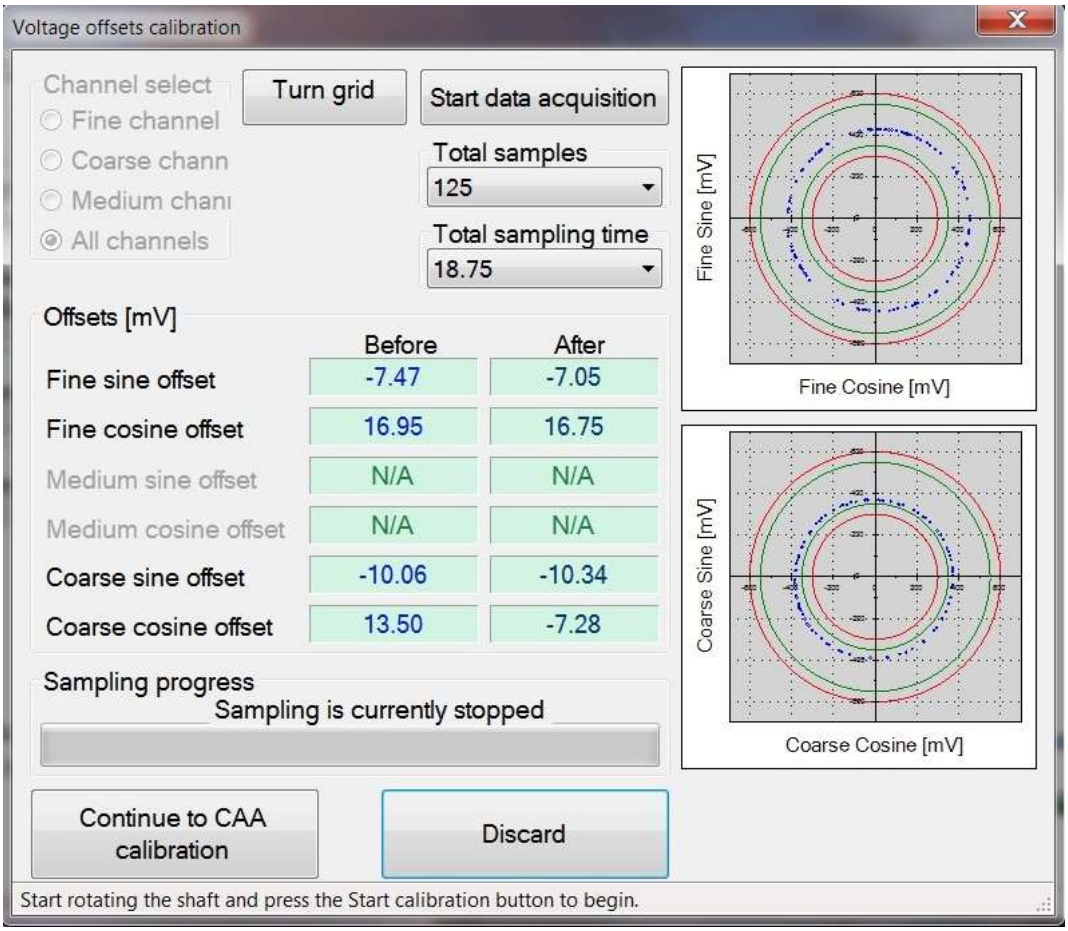
Notify the following:

1. Verify button ***Start data acquisition*** flickering
2. Open the Combo **"Total samples amount"** and select the value 500
3. Do the following:

   i. Manually rotate the Elevation axis fully 90º in one direction, then fully 90º in opposite direction.

   ii. Verify progress of process in the **"Sampling progress"** ruler twice **-** until the button ***Continue to CAA calibration*** flickers

   iii. Note the graph creation during motion in the two windows as specified in the following figure:



   iv. Verify in the **"Offset[mV]"** frame the **"After"** column 4 text boxes values displayed flickering

NOTE:
In case the test drill is completed not satisfactory – then repeat the process by keying the button ***Discard*** followed by press on ***Calib*** button.

NOTE:
Before proceeding to the next step in the procedure it is to ensure that the mechanical payload is assembled to avoid any movement's unbalanced difficulties in instruction performance

g. Key in the button ***Continue to CAA calibration*** – the EA offsets calibration form is displayed:

Notify the following:

1. Verify button ***Start calibration*** flickering

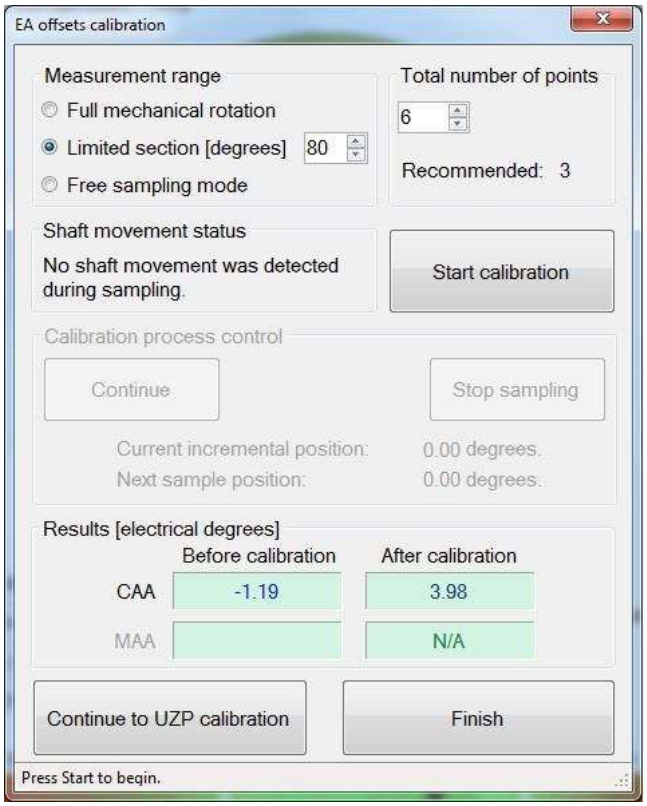
2. Do the following:

   i. Manually rotate the Elevation axis to shift a sector of 30º until the button ***Continue*** flickers.

   ii. At this position place the mouse symbol on the ***Continue*** button and left button to insert the readout

   iii. Repeat step (i) throughout all the Elevation range (6 sectors)

3. In completion of shaft rotating – verify the following screen display:



Notify the following:

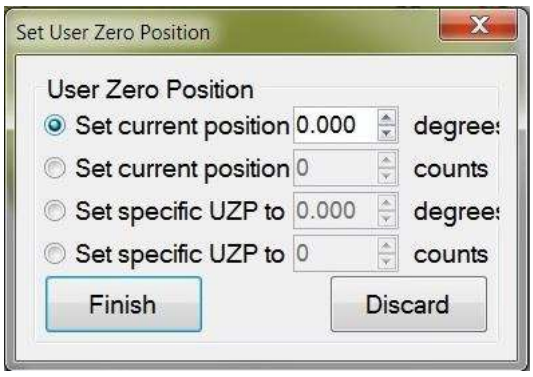
   i. Read out of results values in the **CAA – After calibration** text label

   ii. Button ***Continue to UZP calibration*** flickers

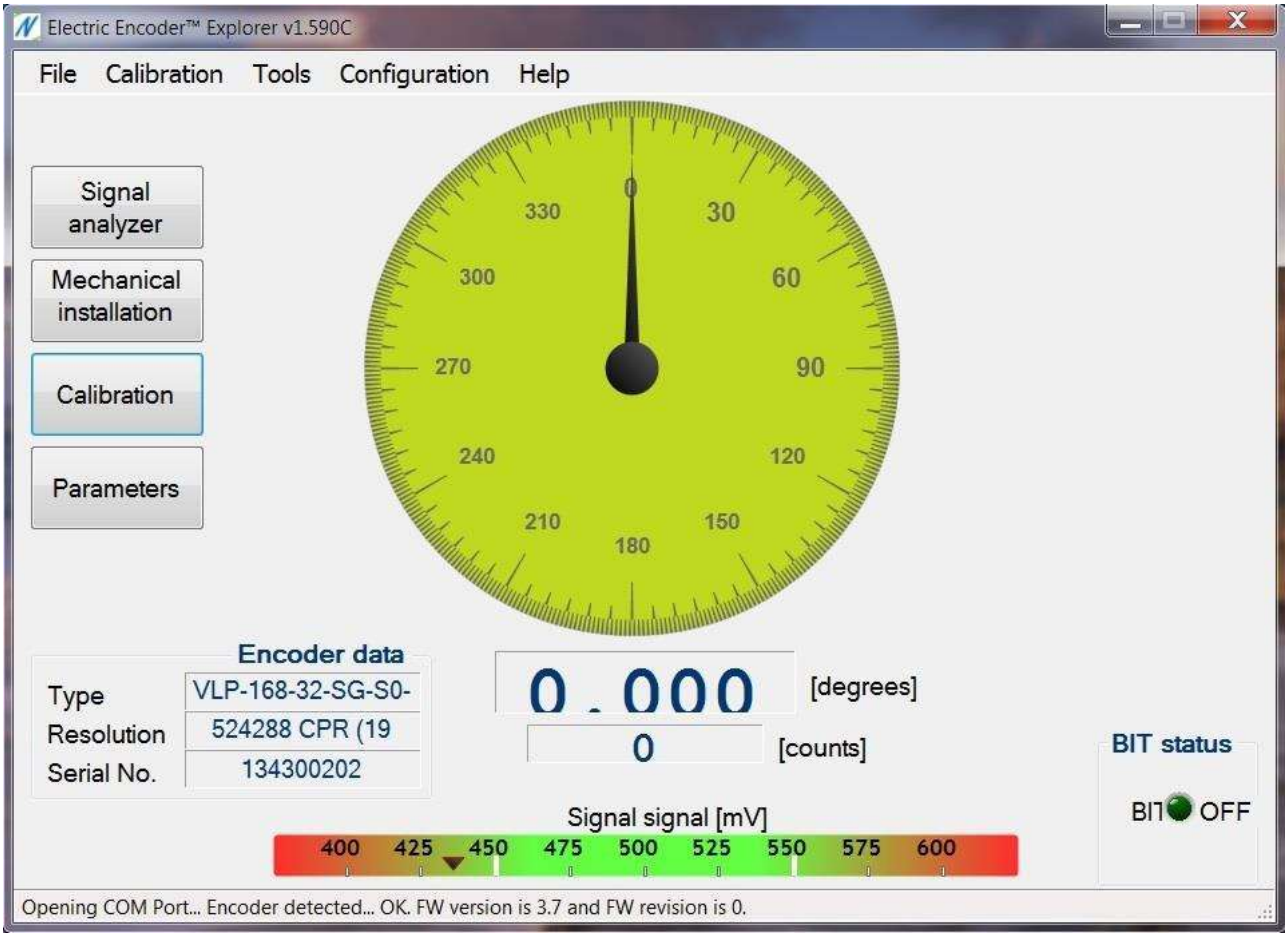
   iii. Key in the button

   iv. Set the elevation shaft in the mechanical zero position, make use with the elevation locker in LOCK position and ensure lock from both directions

h. Verify the form display as follows – readout of 0.000 in the **"Set current position"** label.



i. Key in the button ***Finish*** and verify the display of the main screen with the dial positioned on 0 degrees as follows:



j. At this stage the encoder zeroing process is complete, but repeatability check is required to end the calibration.

k. Go out from the application, disconnect the USB adapter, rotate the elevation shaft to any randomaly position

l. Reconnect the USB adapter, start the Electric Encoder Explorer application again.

m. Verify in the angle display the present position, set to 0º position and ensure readout display of 0 respectively

n. Check the encoder reaction in motion as follows:

   i. Incline the elevation axis in upward direction and verify that the readout is negative

   ii. Incline the elevation axis in down direction and verify that the readout is positive

NOTE:
The Controller software reverses the readout respectively.

End of process.

2. PEDESTAL MOTOR PHASING

2.1 Introduction

Motor phasing is required when a motor is replaced in the pedestal.
This process is to be carried out with the Controller unit which is planned to use in the integrated pedestal.
The motor phasing data will be registered in the Controller memory for matching operation.
The connection to the driver in the Controller is through the Slip Rings (SR) unit fixed part at the base J05 - to allow permanent connection of the special adapter cable into the USB port of the STE computer. (As specified in Figure 2-1 and Figure 2-2)
If not other specified – keep both lockers in LOCK position

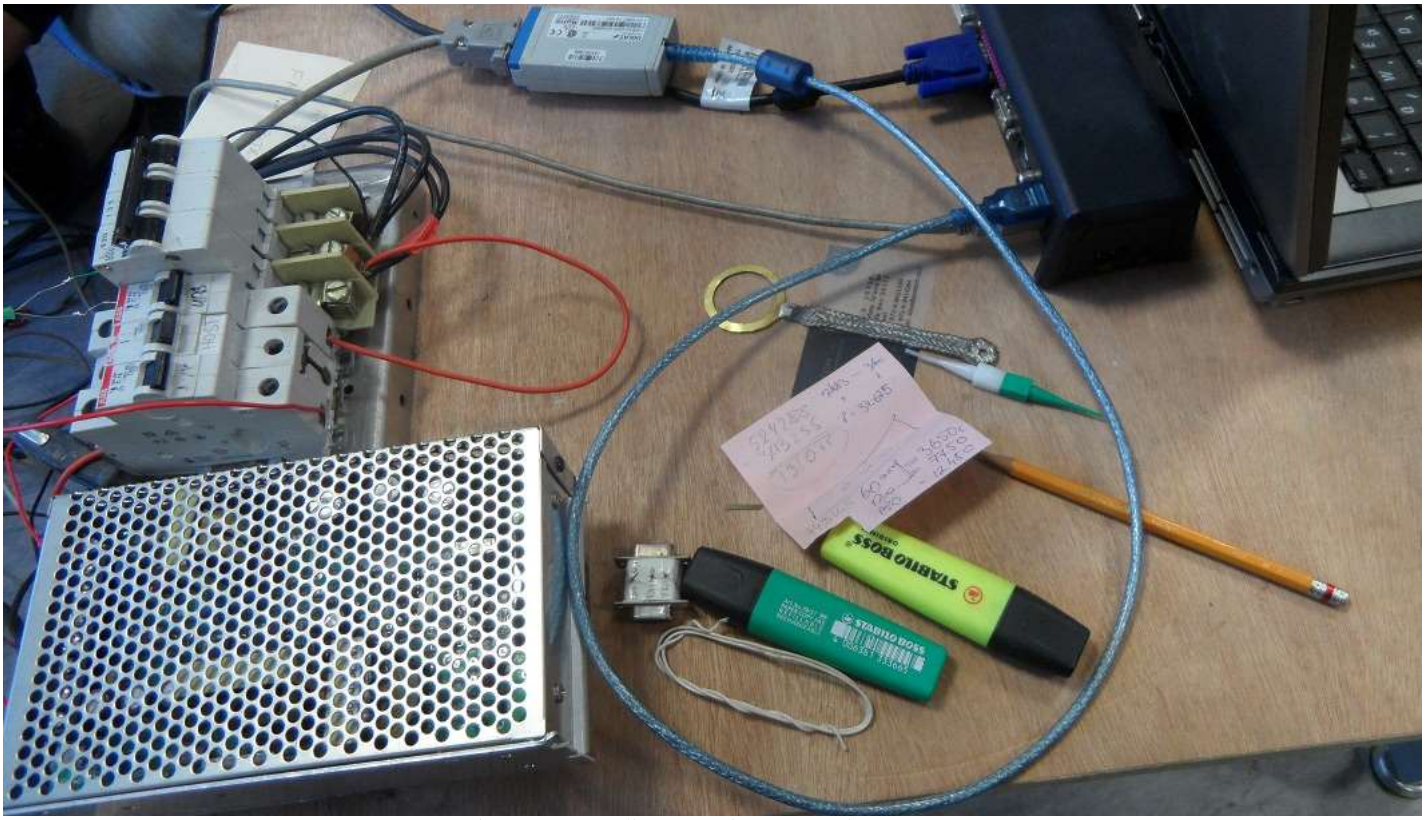


Figure 2-1. Controller Connection – USB Adaptor

Figure 2-2. Controller USB Adapter

2.2 Preparation for Azimuth Motor Phasing Procedure

a. In the Azimuth assembly structure connect the Azimuth Encoder cable to P07 in the Controller unit titled as AZ FEEDBACK.

b. Connect the USB cable P14 to the Controller plug titled as CAN USB (the drivers connection coming from the SR movable part)

c. Connect the special test adapter from J05 (SR fixed side) to the STE computer USB port and apply supplies to the pedestal.

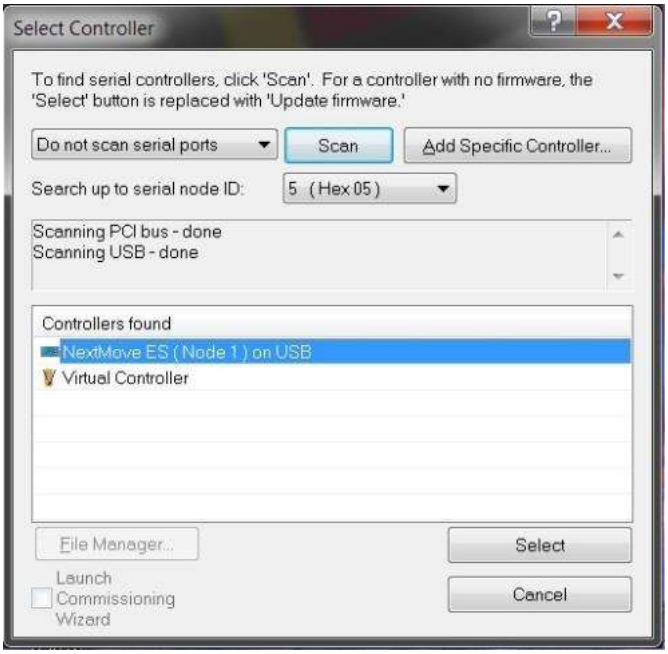
Figure 2-3. Azimuth Motor Phasing Connection

2.3 Azimuth Motor Phasing Procedure

a. Switch ON the STE, in completion of computer start up identify the **Mint Workbench** application icon:

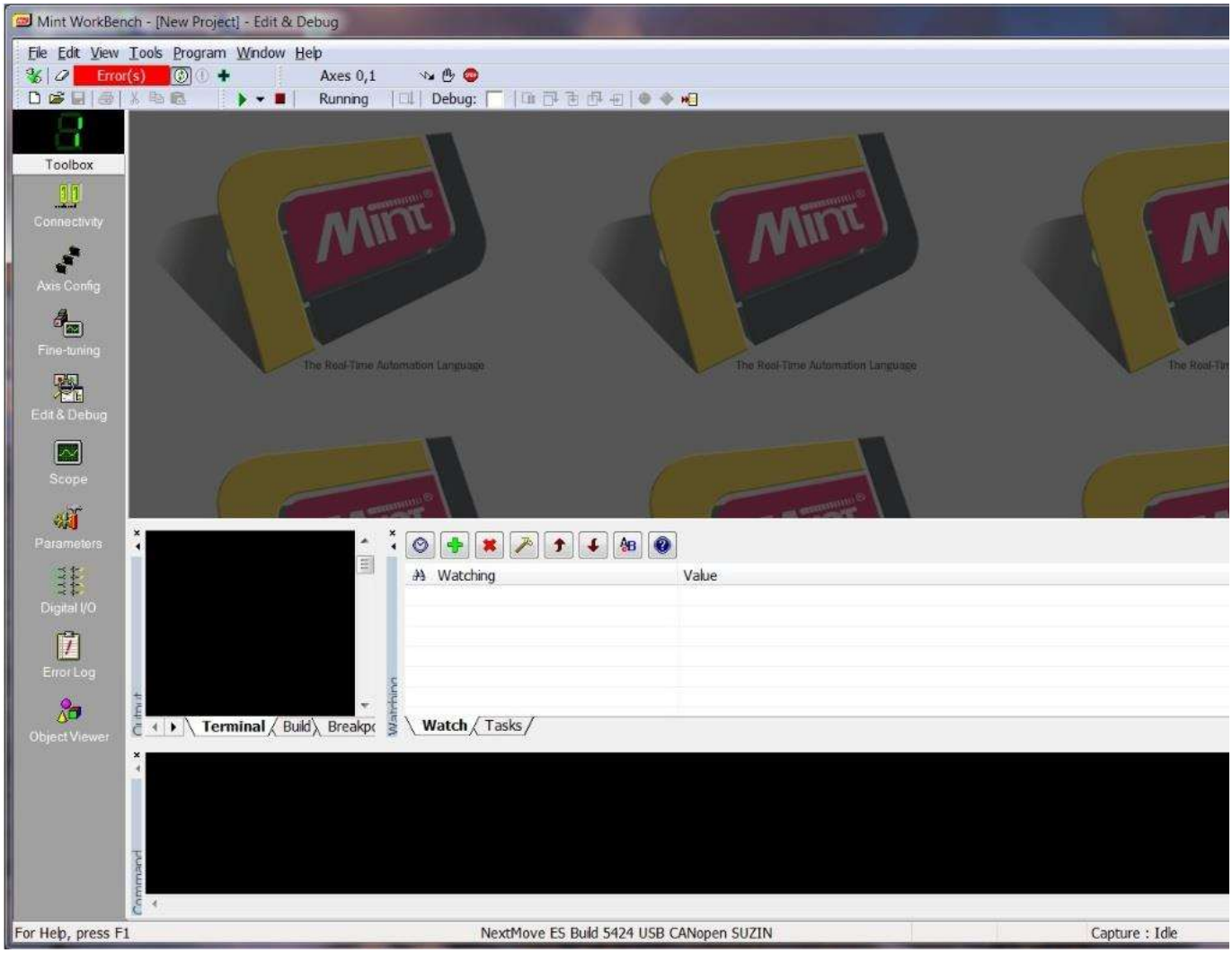
b. Startup the application and verify the opening screen display:

c. Key in the button ***Start Online Project*** and verify the following **Select Controller** form screen display:

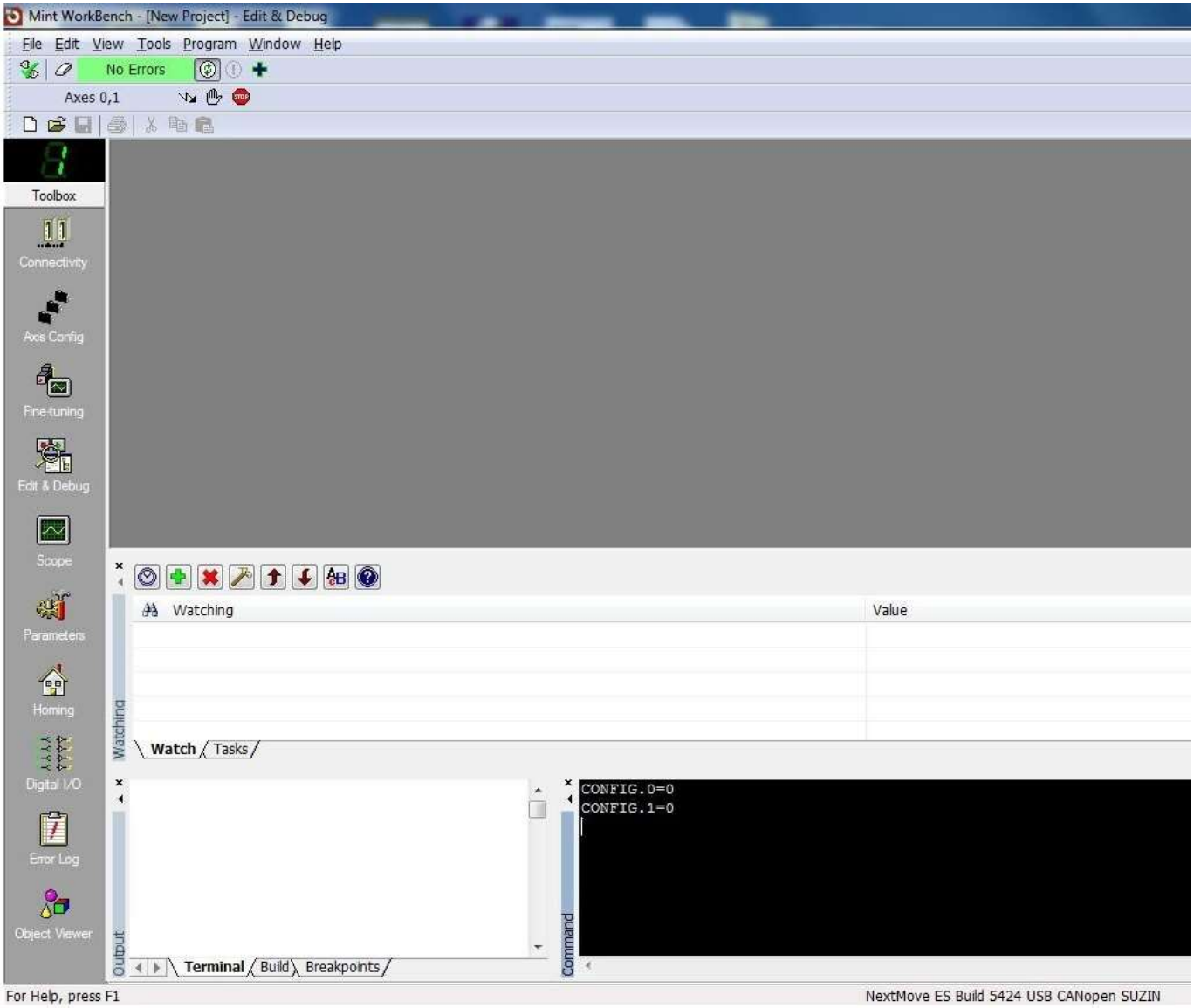


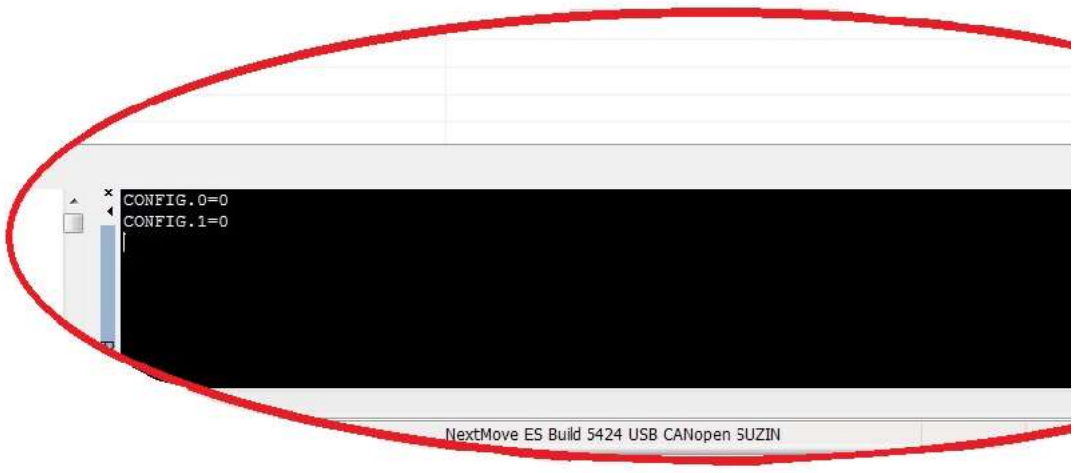
d. Identify the Controller presence identification – Node 1 USB in the List View board titled as **Controllers found**

e. Key in the button ***Select*** and verify the following **Edit & Debug** form screen display:

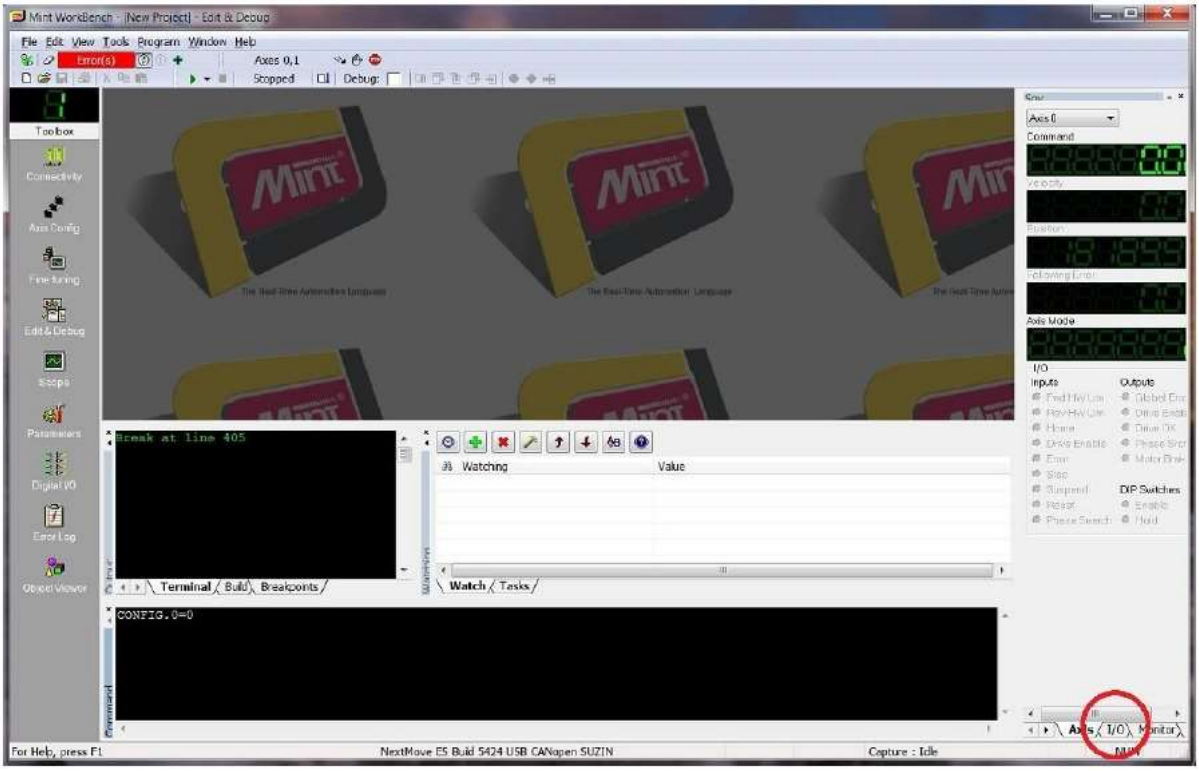


f. Select in the form upper menu bar **Program > Stop Existing**, place the mouse cursor in the lower work window screen and do the following:
Type "Config.0=0" followed by ENTER
Type “Config.1=0” followed by ENTER

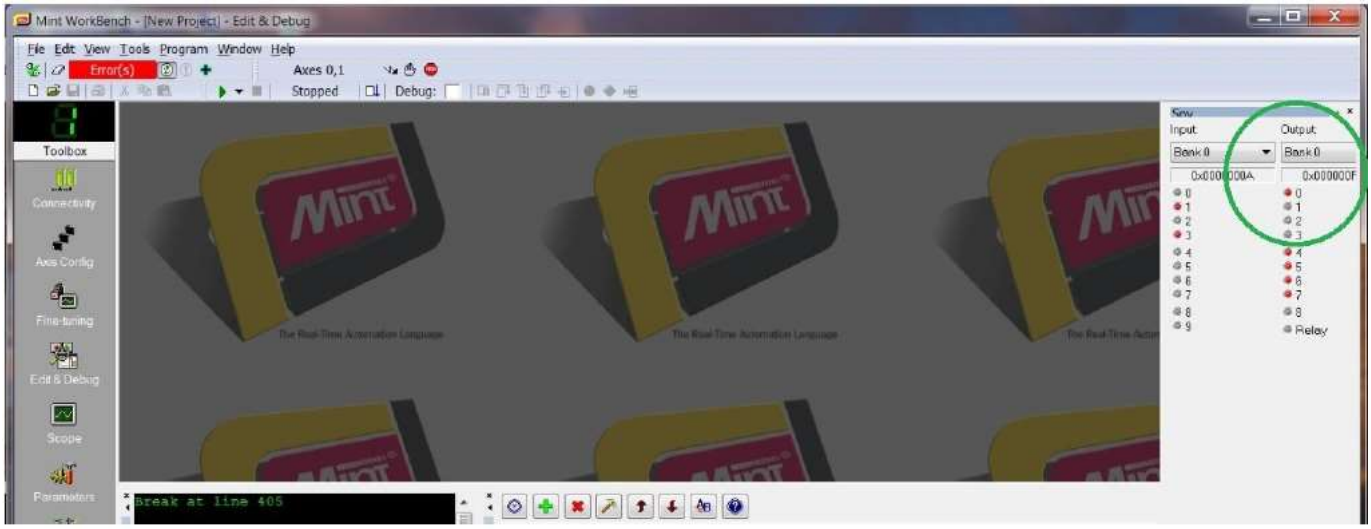




g. In the bottom right side of the form – open the Tab Script **"I/O"**



Verify the following screen display:



h. Select the radio button ***"0"*** and ***"1"*** in the right column "Output" (See above figure mark)

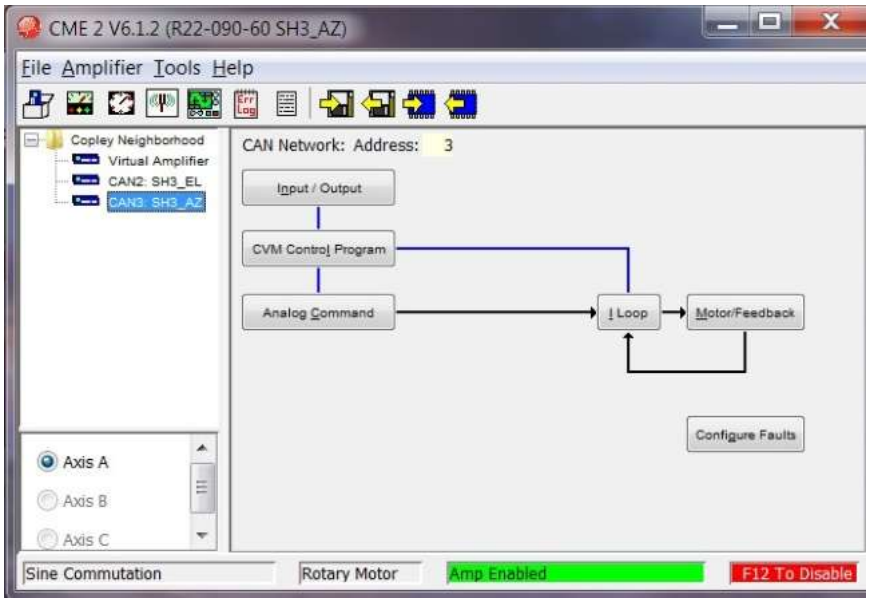
i. Identify noise coming out from the Azimuth and Elevation motors.

j. Minimize the present form display and start up the application **CME2** by the following icon:

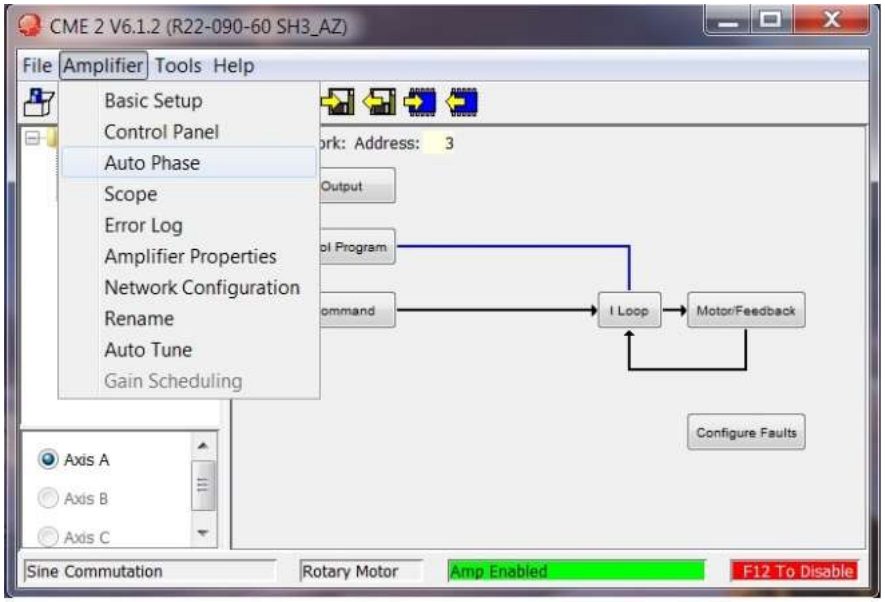
k. Verify the following form display and select **CAN Network** radio button:

l. Unlock (if locked) all **lockers**

m. Wait some seconds to the appearance of the following screen display:



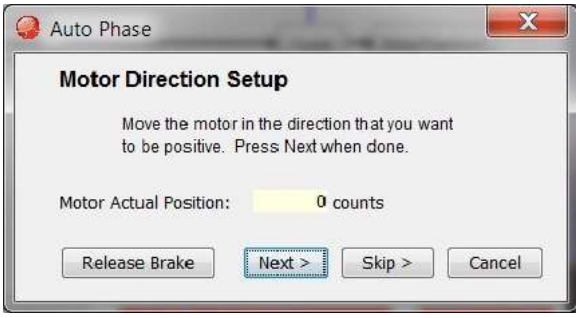
n. In the main screen select **Amplifier > Auto Phase** as follows:



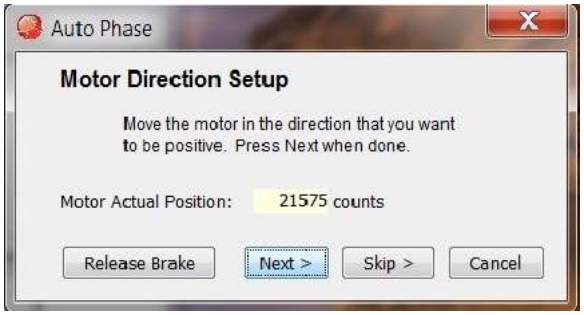
o. The following dialog box is displayed:

p. Key in the ***OK*** button and verify:

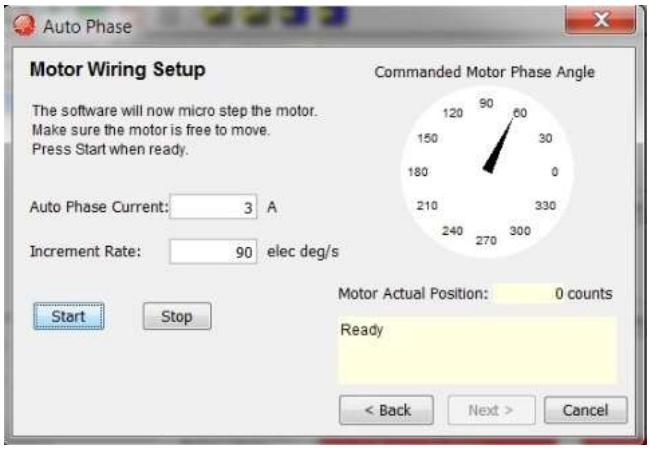
The noise from the motor stops and the following message is displayed:



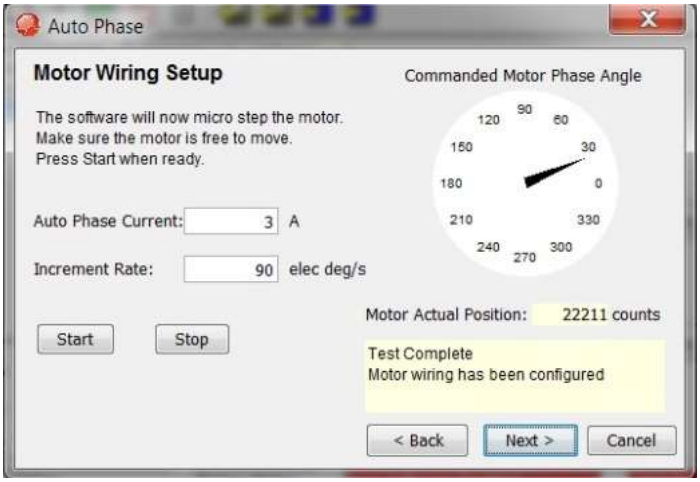
q. Rotate manually the Azimuth axis in CCW direction and identify increasing readout value in the **"Motor Actual Position"** text box:



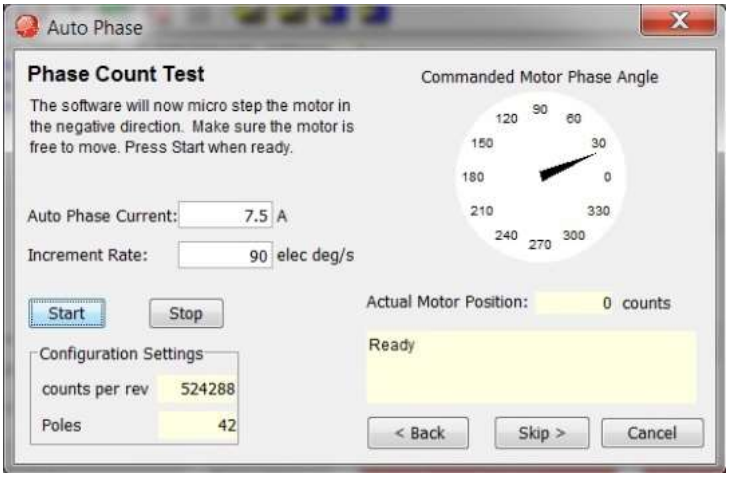
r. Key in the ***Next*** button and the following screen is displayed:



s. Key in the ***Start*** button, now the automatic test is carried out accompanying noise from the Azimuth motor, and at the end of the test – the following **"Test Completed"** string is displayed in the form screen:

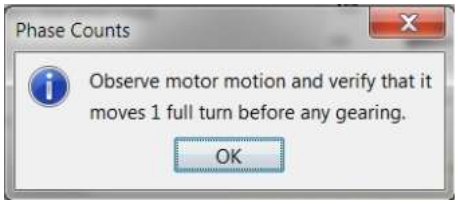


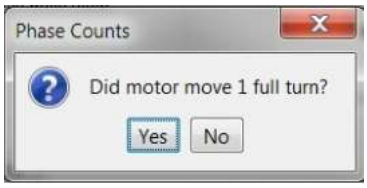
t. Key in the ***Next*** button to the following screen display:



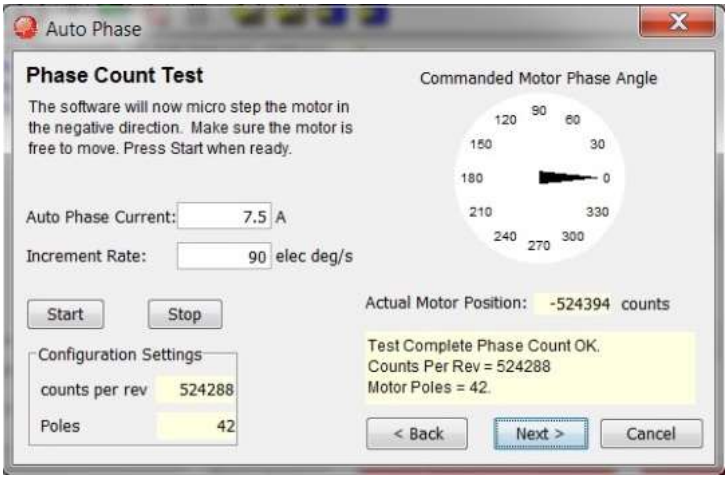
u. Key in ***Start*** button and verify the Azimuth axis moves fully one round in slow motion

v. Approve the following dialog boxes in due time of drill:

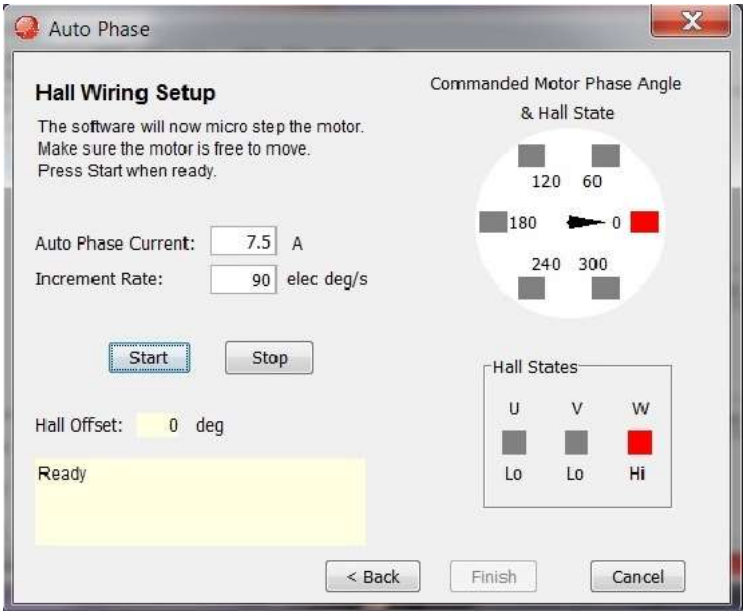




w. In end of drill key in the ***Yes*** button, verfiy noise from the motor stops and the following screen display:

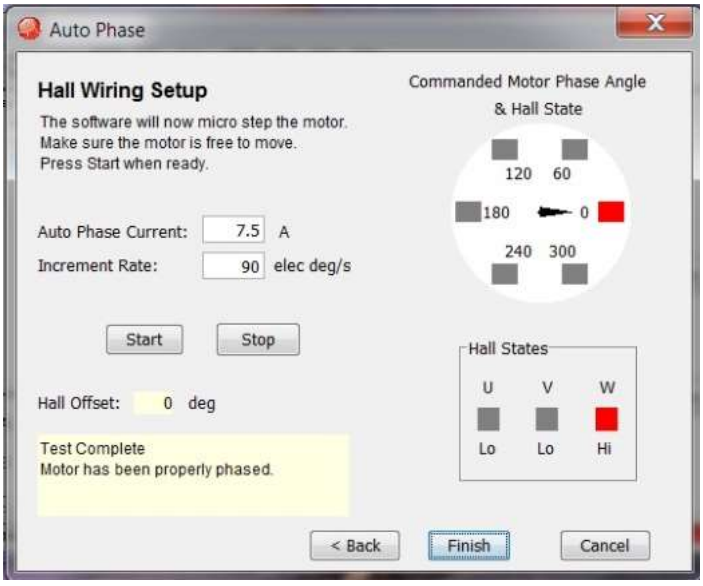


x. Key in the ***Next*** button and the following screen is displayed:



y. Key in the ***Start*** button, the motor will move the Azimuth axis one round automatically.

z. Wait until end of test drill and verify the display of the next screen:



aa. Key in the ***Finish*** button

End of process.

2.3.1 Save Calibration Process

a. Now the calibration file is to be saved in the Controller flash memory:

b. In order to save the file in the computer Hard Disk memory – the following procedure is to be carried out:

c. The link is to be organized in the project file as follows:

SH3_AZ_103_v1.CCX

d. Close all applications.

2.4 Elevation Motor Phasing Procedure

2.4.1 Installation of Pedestal Controller Base in Elevation Support

Verify Controller connected as follows:

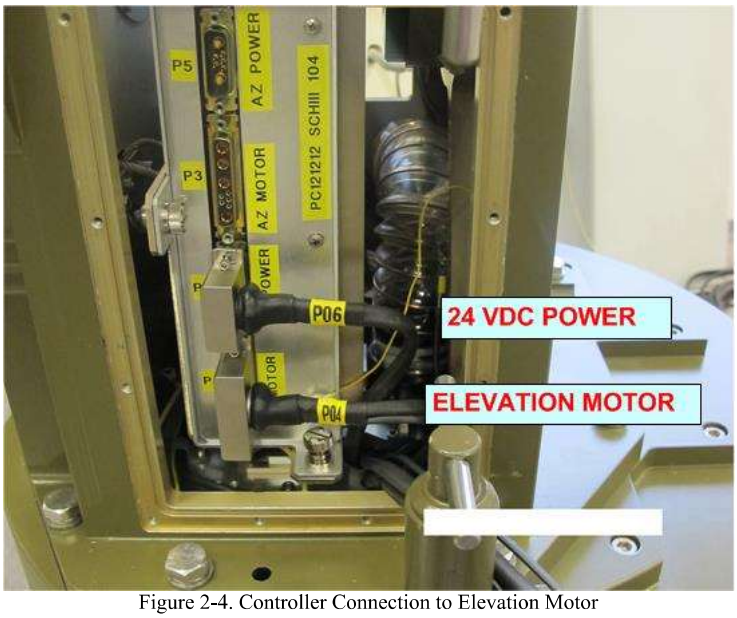


Figure 2-4. Controller Connection to Elevation Motor

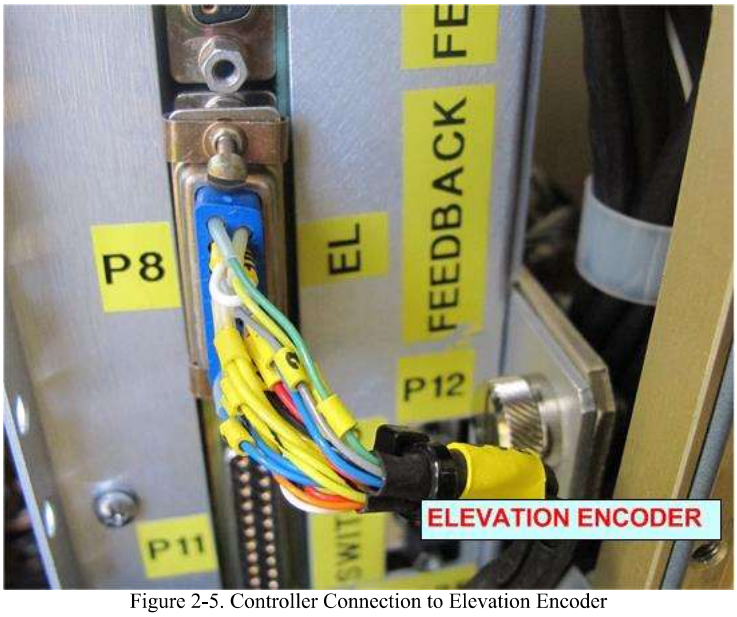


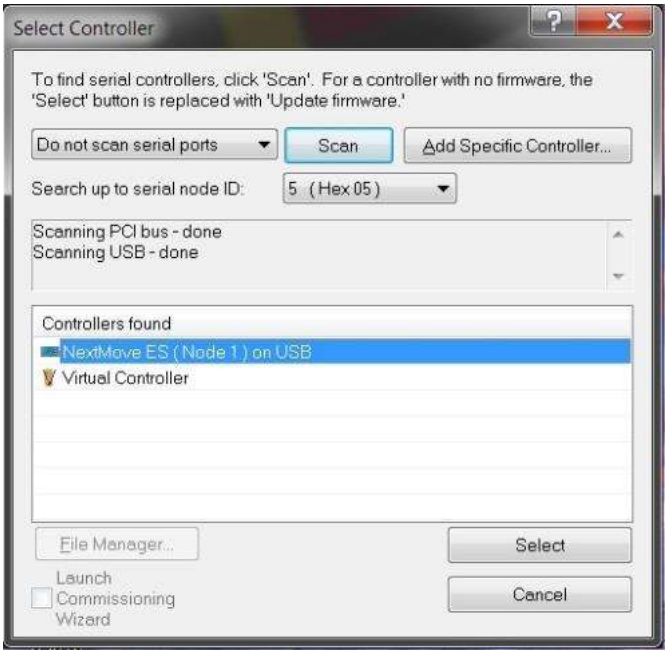
Figure 2-5. Controller Connection to Elevation Encoder

2.4.2 Elevation Motor Phasing Procedure

a. Switch ON the STE, in completion of computer start up identify the **Mint Workbench** application icon:

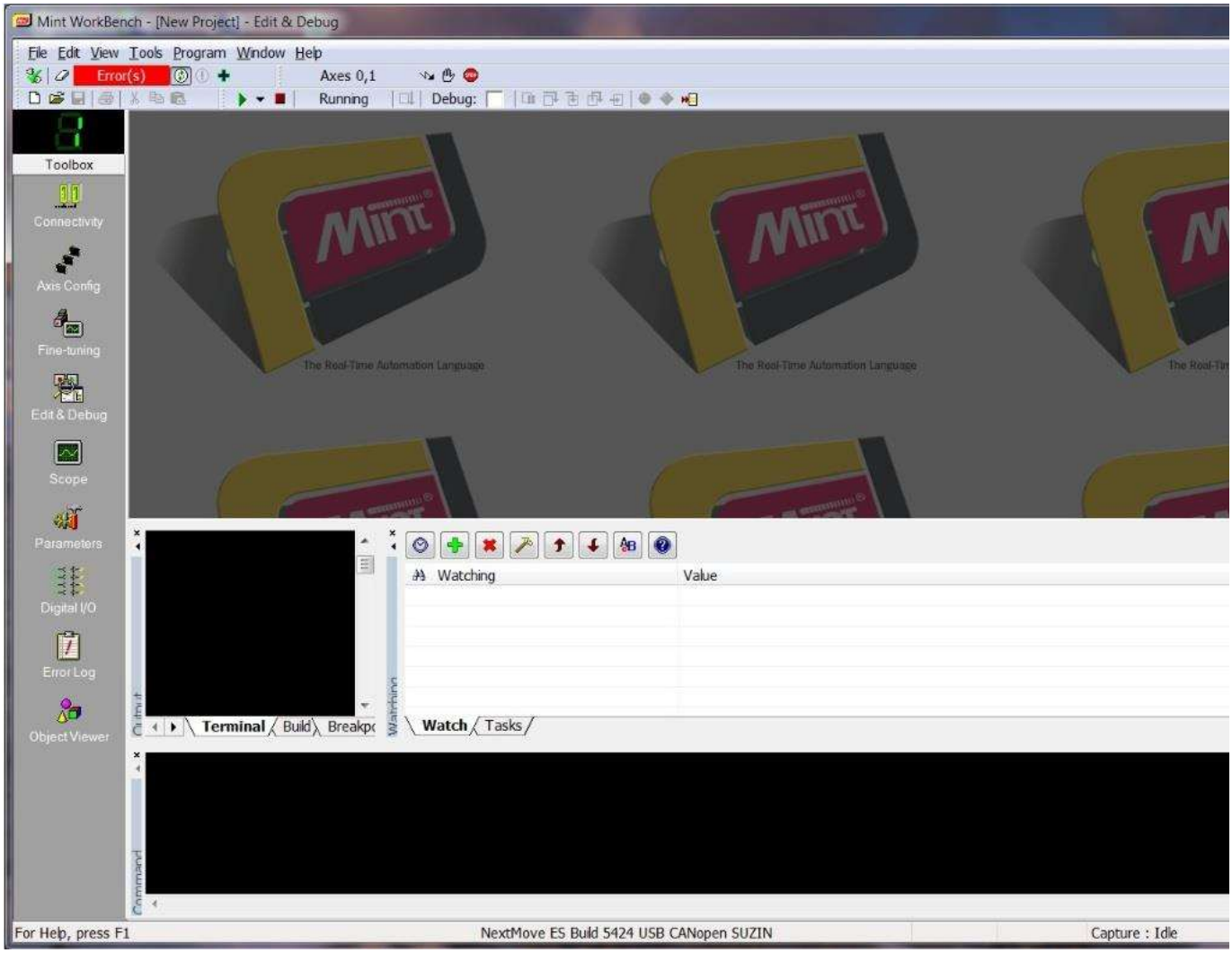
b. Startup the application and verify the opening screen display:

c. Key in the button ***Start Online Project*** and verify the following **Select Controller** form screen display:

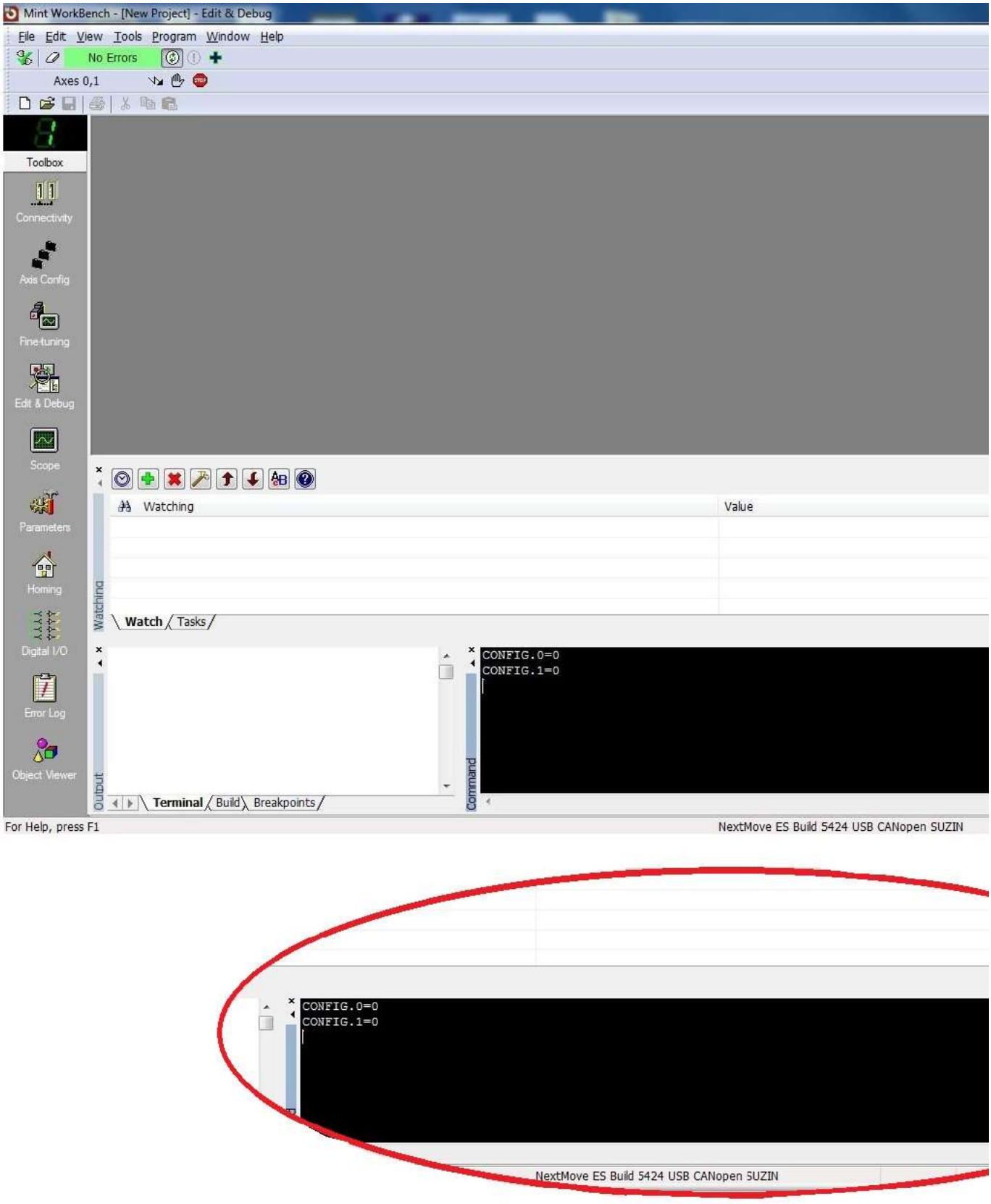


d. Identify the Controller presence identification – Node 1 USB in the List View board titled as **Controllers found**

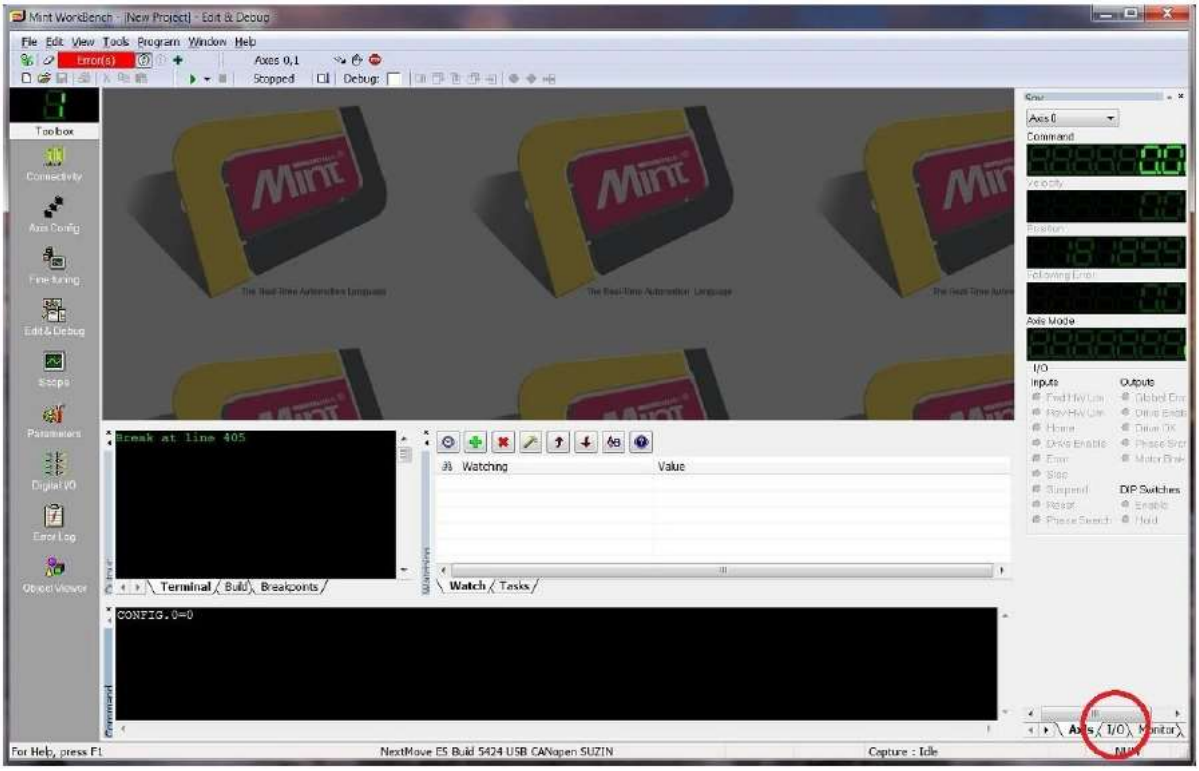
e. Key in the button ***Select*** and verify the following **Edit & Debug** form screen display:



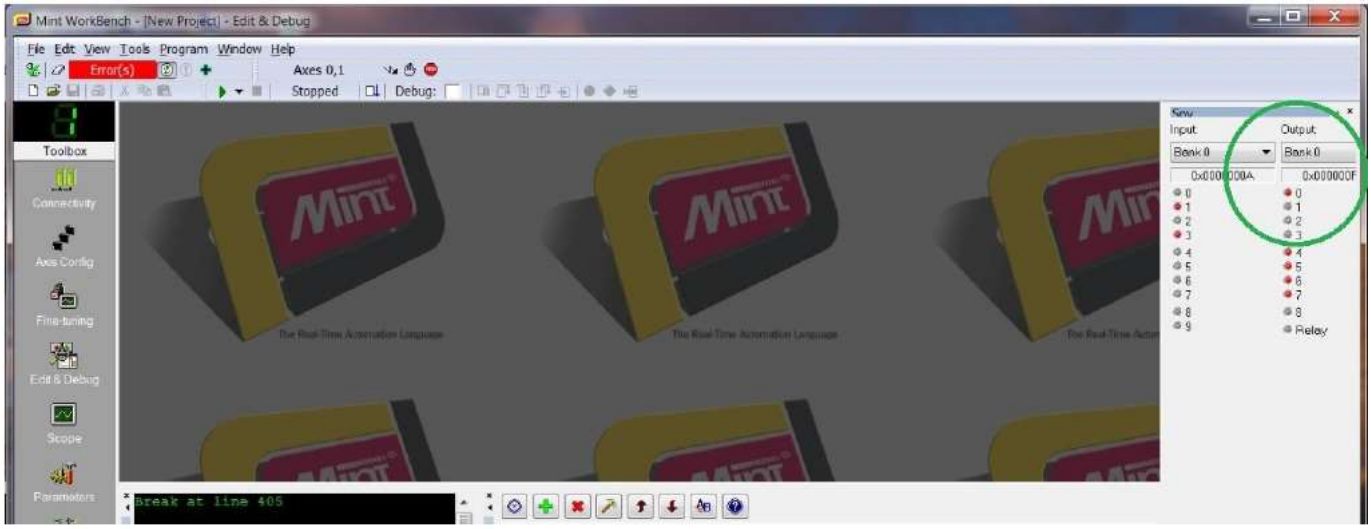
f. Select in the form upper menu bar **Program > Stop Existing**, place the mouse cursor in the lower work window screen and do the following:
Type "Config.0=0" followed by ENTER
Type “Config.1=0” followed by ENTER



g. In the bottom right side of the form – open the Tab Script **"I/O"**



Verify the following screen display:



h. Select the radio button ***"0"*** and ***"1"*** in the right column "Output" (See above figure mark)

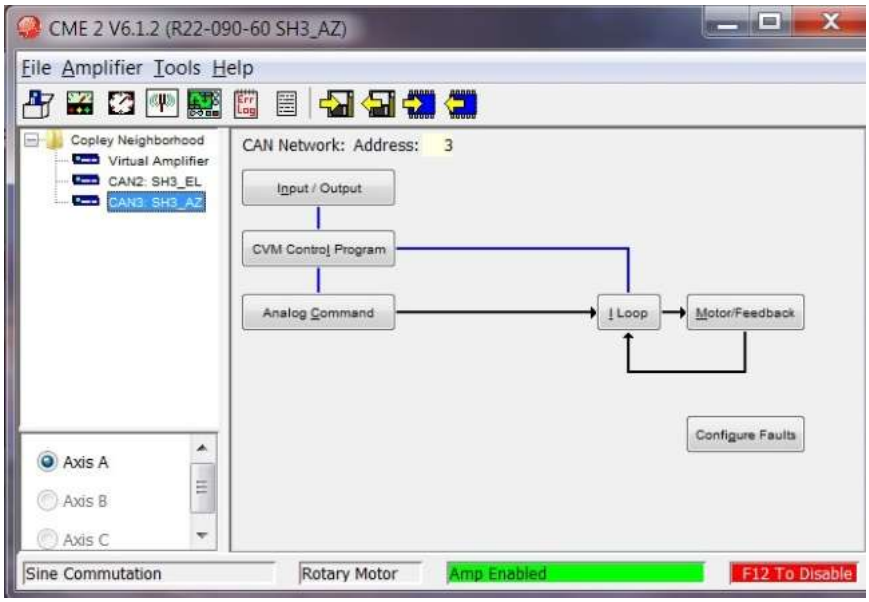
i. Identify noise coming out from the Azimuth and Elevation motors.

j. Minimize the present form display and start up the application **CME2** by the following icon:

k. Verify the following form display and select **CAN Network** radio button:

l. Unlock (if locked) all **lockers**

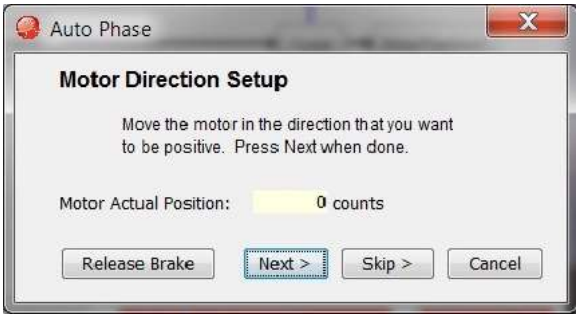
m. Wait some seconds to the appearance of the following screen display:



n. In this stage, it is required to simulate a non-limit state (LIMIT=OFF) in the Elevation by connection of switching board to the controller P11 and the following form is displayed:

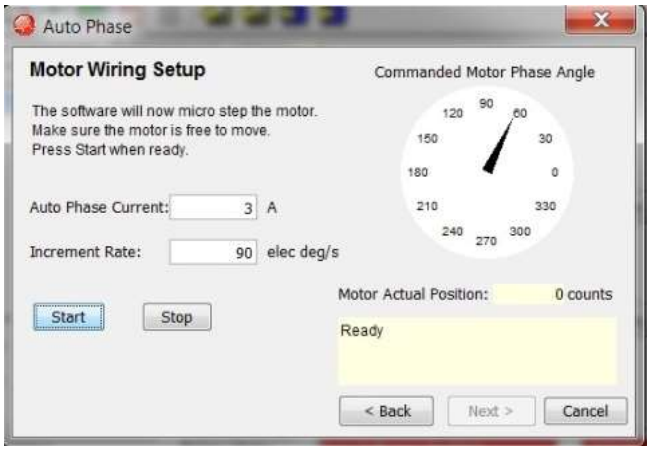
NOTE:
In this stage the directions are defined as follows:
Decline of LOS defined as positive
Therefore – Hold the axis at position of 45 degrees for start default test position state.

o. Key in the ***OK*** button and verify the next form:

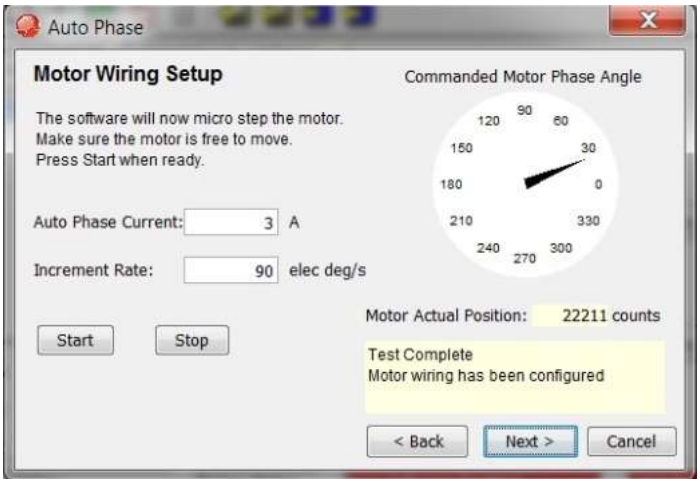


p. Rotate the elevation shaft manually towards the locker (Down direction when look from the encoder side), verify number in the **"Motor Actual Position"** label - followed by key in the ***Next*** button.

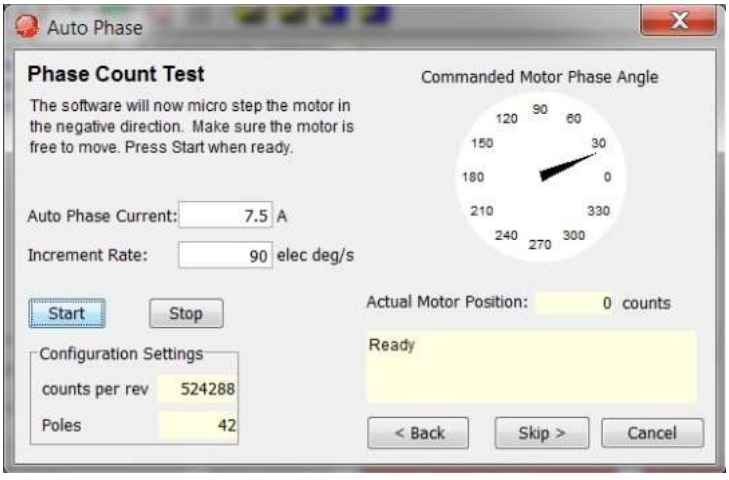
q. The following form display:



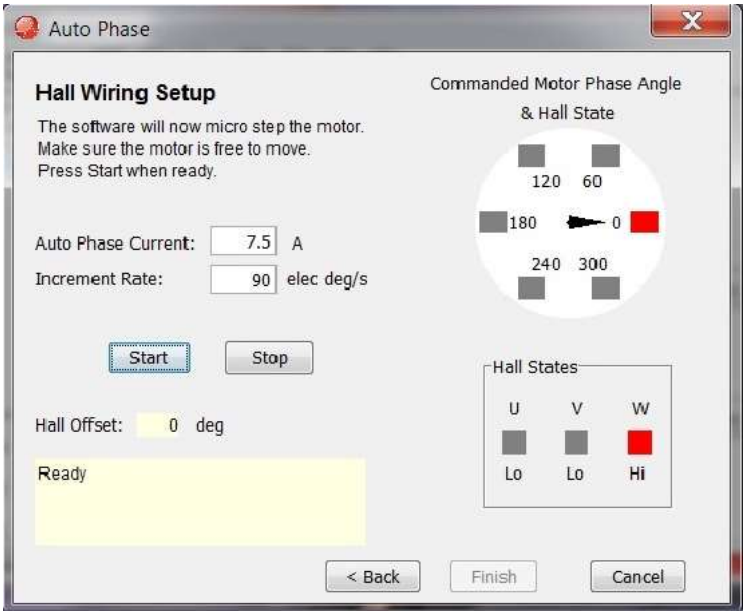
r. Key in the button ***Next***, verify the automatic test performance until the following form display when **Test Complete** string appears:



s. Key in ***Next*** button followed by key in on ***Skip*** button - verify the next screen display:

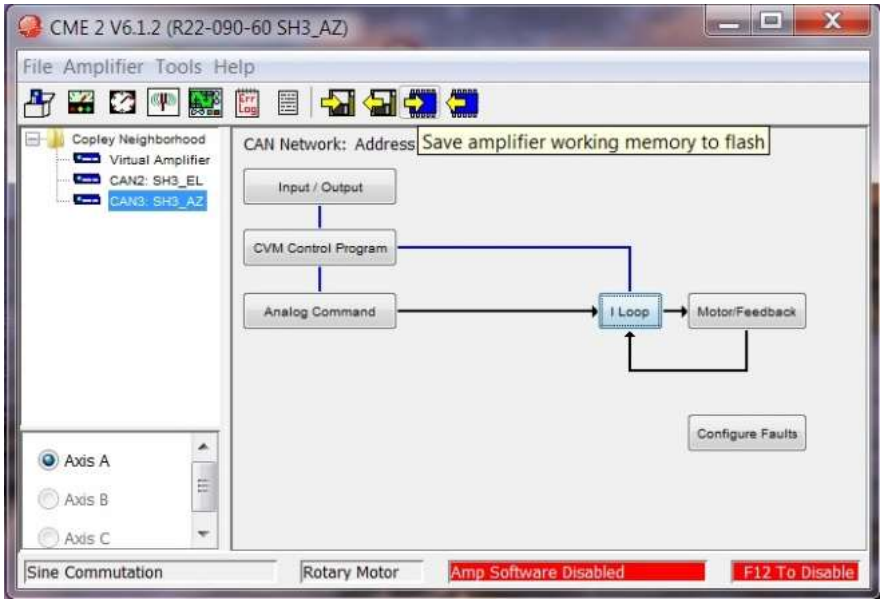


t. Key in ***Start*** button and verify the next screen display:

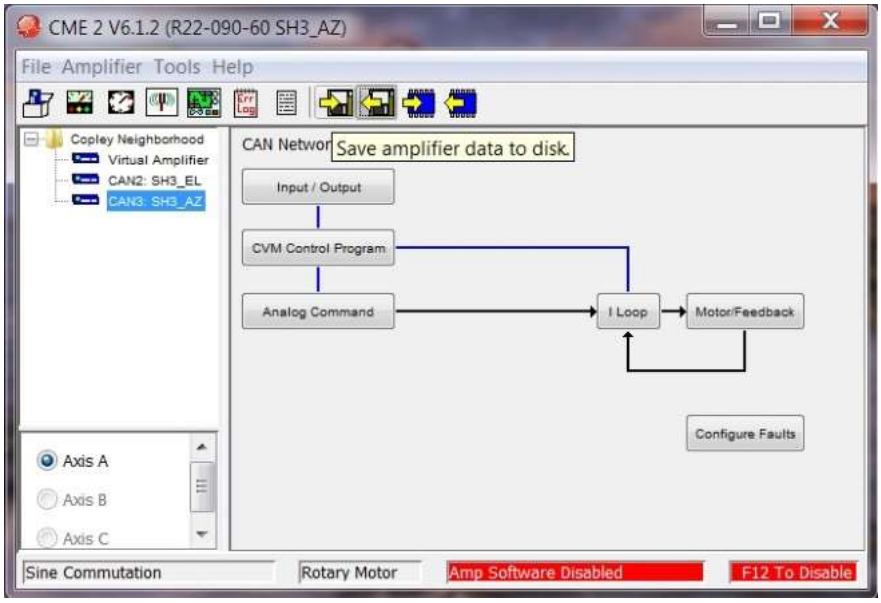


u. Key in ***Start*** button, wait for ***Finish*** button to be enabling, key in and go back to main screen.

v. Save to flash disk by select ***SAVE*** from upper menu bar to save calibration file:



w. Select save to computer HD from upper menu bar:



x. Disconnect all test setup.

End of process.

3. CONTROLLER REPLACEMENT

3.1 Introduction

A new controller mounting in a pedestal requires the installation of the existing pedestal motors phasing data to be downloaded from the computer HD to the controller.

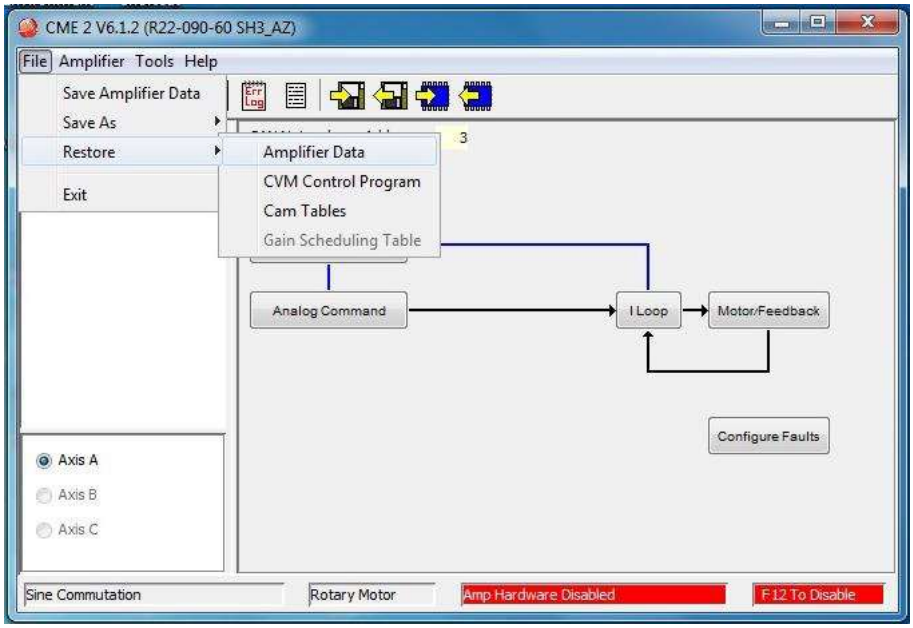
3.2 Procedure

a. Lock the pedestal azimuth and elevation lockers

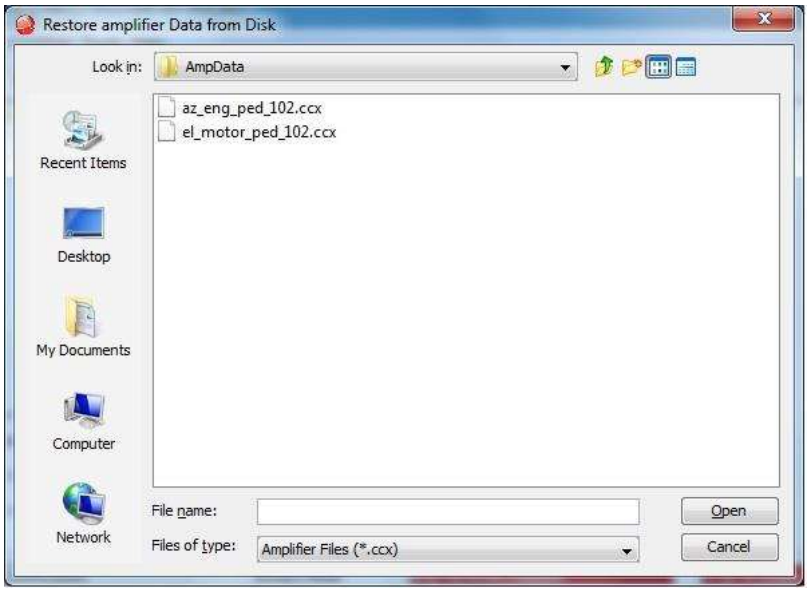
b. Apply main supplies to the pedestal

c. Run the **CME** application

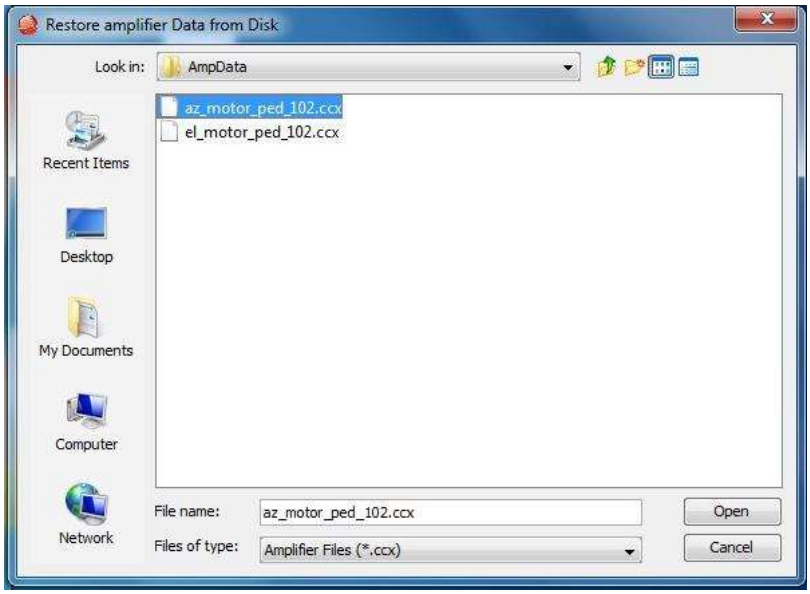
d. From the main form select: **File > Restore > Amplifier Data**



c. Verify the following screen display:

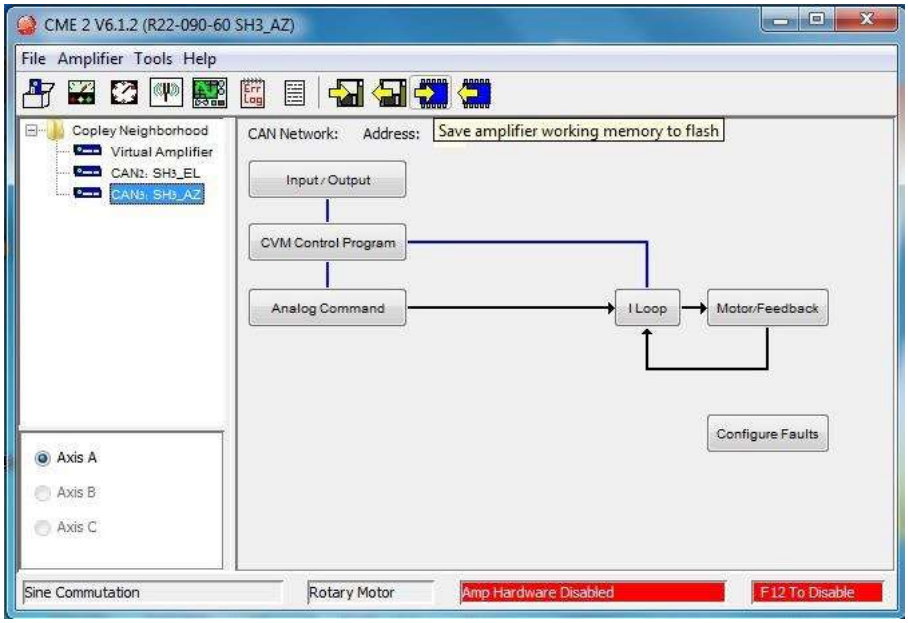


f. Select the **AZ** channel as follows:



g. Key in the ***Open*** button and verify the following dialog form:

h. Key in the ***OK*** button and verify the display of the form to transfer the file from the computer HD to the controller as follows:



i. Elevation loading as to be carried out as specified above.