Subject: **Communicating with LabVIEW using SCL and eSCL**
Applies to: STAC5, SVAC3, ST5/10, SV7, STM17/23/24, SWM24, SSM, TSM, TXM and SV200
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Overview

This document will guide the user through the setup and interface of an Applied Motion stepper drive, integrated stepper, StepSERVO™ or servo drive to National Instruments LabVIEW®. The user should have a basic understanding of the LabVIEW® software. The Applied Motion product must first be configured using the Applied Motion software required based on the series being used (see list below). The software can be downloaded from http://www.applied-motion.com/products/software.

These examples use the ST5-Q-NN and the ST10-Q-EN stepper drives specifically, but will also apply to the SVAC3*, STAC5*, STAC6**, STM17**/23/24, SWM24, SSM*, TSM**, TXM, SV200 and SV7 drives and integrated motors. If a product other than the ST5 or ST10 is used, consult the appropriate documentation for specific instructions. All software is available from the Applied Motion website (www.applied-motion.com/software). Once configured (and tuned in the case of servo and StepSERVO™), the instructions in this document detail how to send and receive data using LabVIEW®. Basic motion control concepts will also be discussed.

*SVAC3, STAC5 and SSM models are available with Ethernet communication only.
**STAC6, STM17 and TSM models are available with Serial communication only.

Before getting started, be sure to install the appropriate Applied Motion Products configuration software:

Series of drive or integrated motor	Configuration Software
STAC5, ST5, ST10, STMxx	*ST Configurator™*
SV7, SVAC3 servo drives	*QuickTuner™*
SSM, TSM, TXM StepSERVO	*Step-Servo Quick Tuner*
SV200 servo drives	*SVX Servo Suite*

Drive Setup

The ST5/ST10 drive is configured with the *ST Configurator* software, available from the Applied Motion Products website (www.applied-motion.com/software).

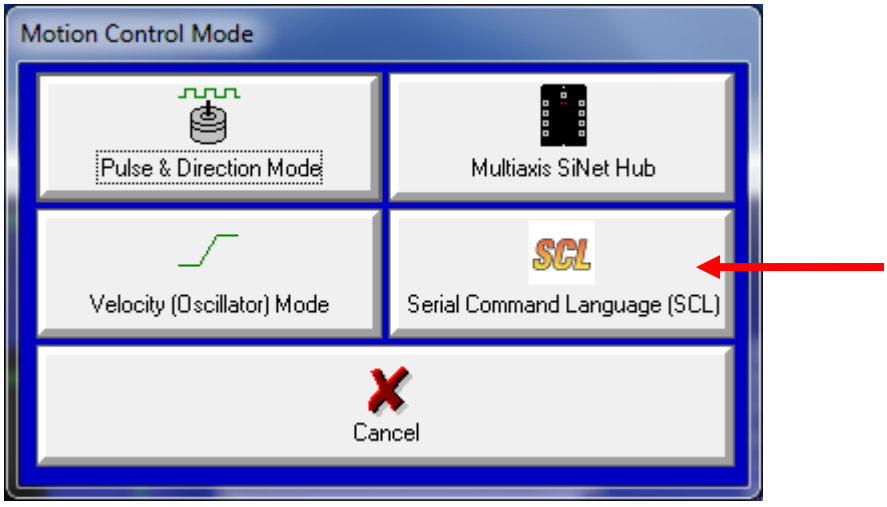
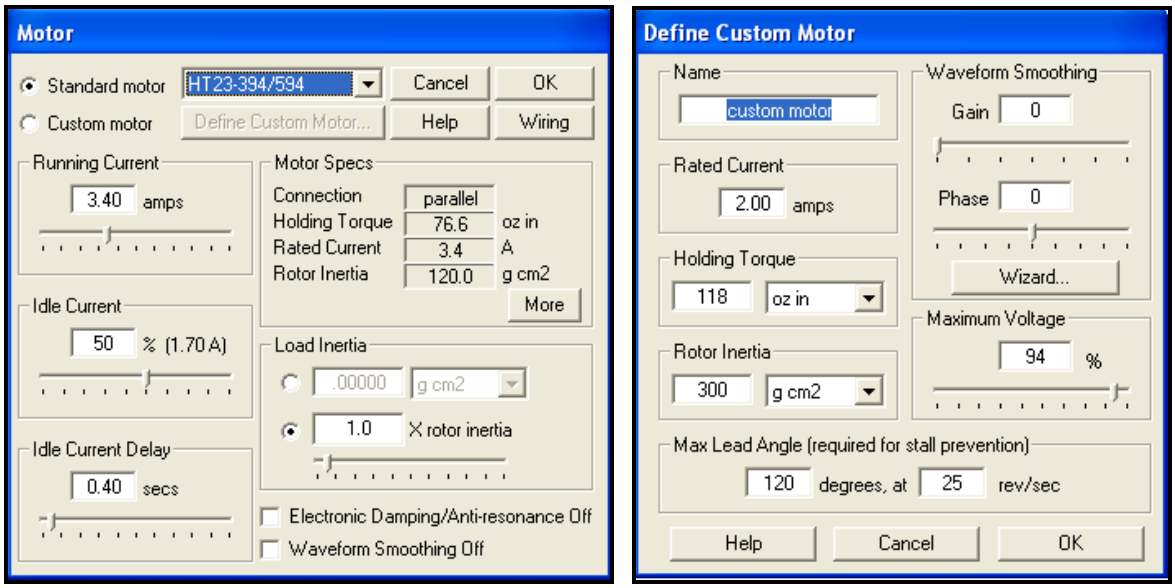


Figure 1: Select SCL from Motion Control Mode panel in *ST Configurator*

Ensure that Serial Command Language (SCL) is selected as the Motion Control Mode (Fig. 1).



Figures 2 & 3: Motor setup panels from *ST Configurator*

If an Applied Motion Products motor is used, a preconfigured motor may be selected from the standard drop-down menu shown in the left configuration window. If a third-party motor is being used, it may be defined using the custom motor configuration option shown on the right.

Once finished, download the configuration to the drive by clicking 'Download to Drive' on the main interface of *ST Configurator*.

Ethernet Setup

There are a few simple steps to Ethernet communication between the stepper drive and LabVIEW.

1) Select an IP address for the ST10-Q-EN that is in the same subnet as your PC and connect it to the Ethernet port. Refer to the hardware manual of the specific Applied Motion drive for information on selecting and changing the IP address.

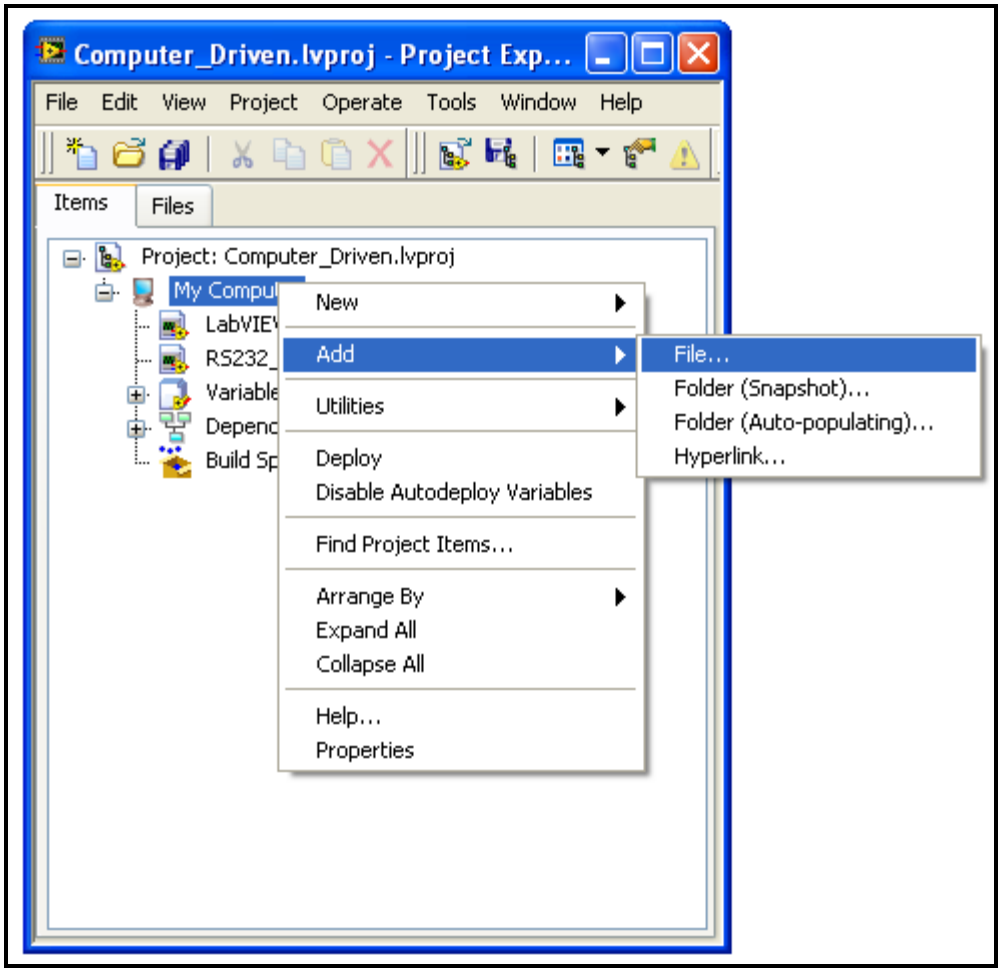


Figure 4: Adding files in LabVIEW

2) Under My Computer, find and add the LabVIEW_Ethernet_Comm.vi that came in the ZIP folder with this application note.

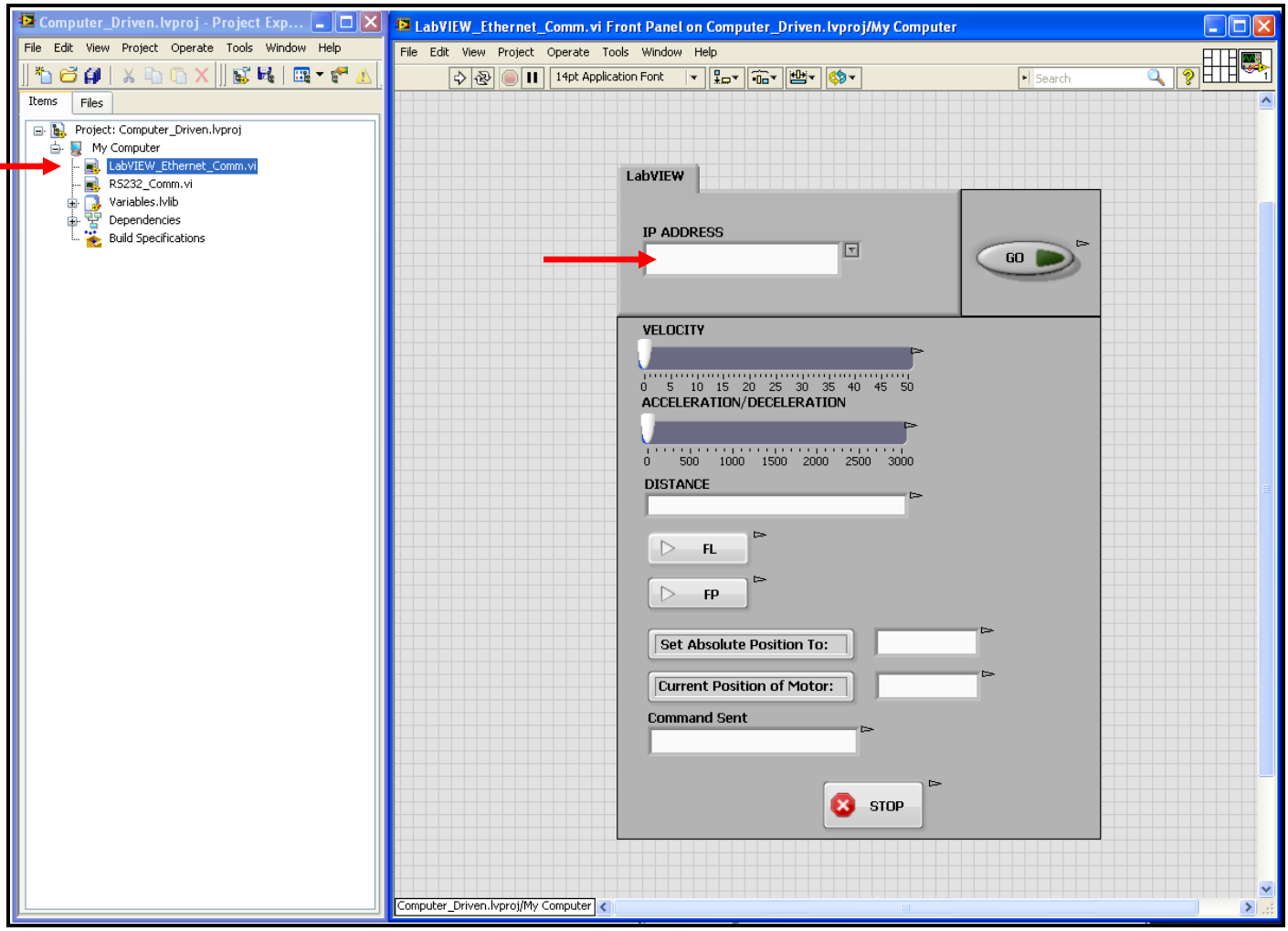


Figure 5: Sample LabVIEW user interface for Ethernet communication

3) Open up the 'LabVIEW_Ethernet_Comm' VI and select the IP address of your drive from the IP ADDRESS drop-down indicated by the red arrow in Fig. 5.

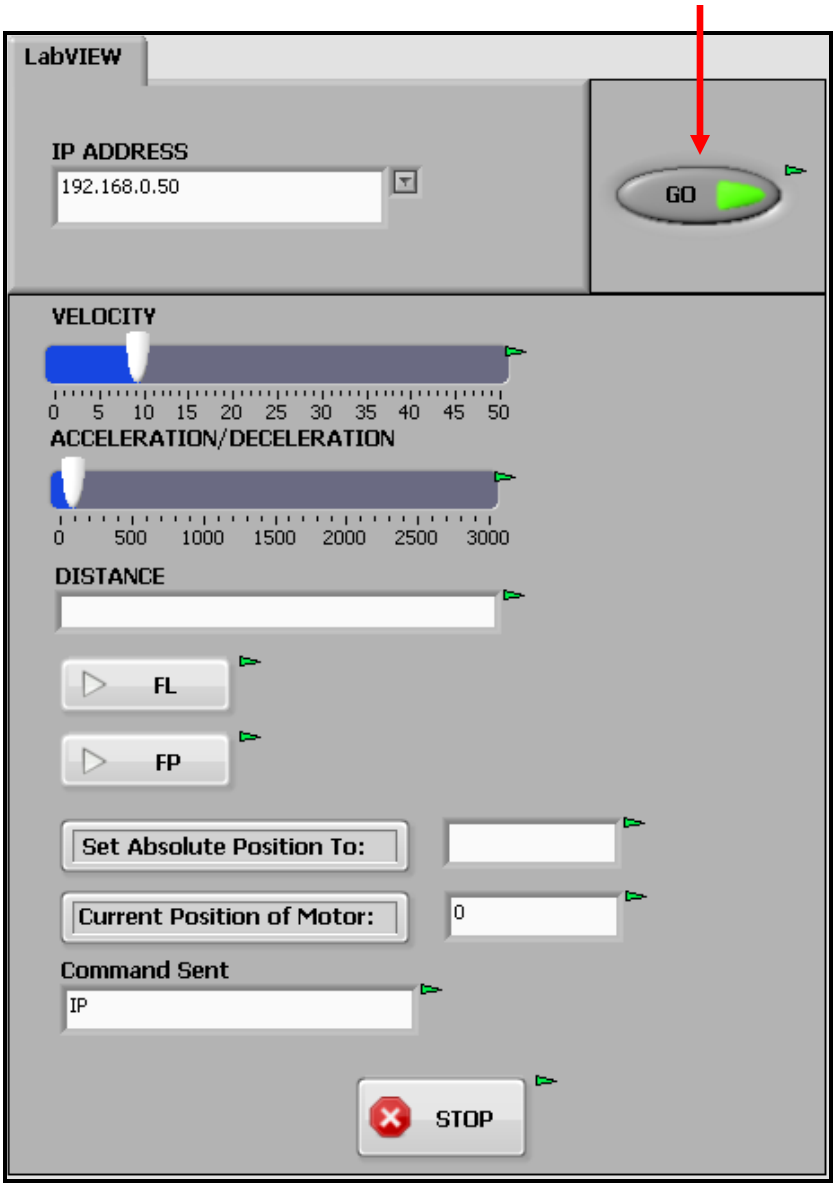


Figure 6: Sample graphical user interface for Ethernet communication

4) Run the VI. If a TCP connection is established, considering you set up the IP address of your drive correctly, the "GO" button will light up green indicating that your drive is ready to receive SCL commands as shown in Fig. 6. (See Fig. 10 below for a description of each field and button on the sample user interface.)

For more examples on LabVIEW TCP Communication, please refer to http://www.ni.com/white-paper/2710/en/.

NOTE #1: *Do not stop the VI and try to restart the VI too quickly because the TCP Port may still be in the process of being closed by LabVIEW. Doing this will cause the following error:*

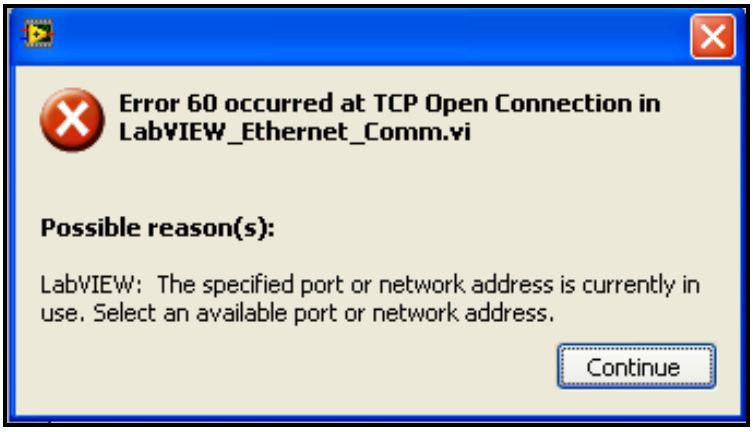


Figure 7: LabVIEW TCP Connection Error

To eliminate the error, power cycle the drive.

NOTE #2: *The TCP/IP implementation on Applied Motion Products drives and integrated motors has a connection time-out of 20 seconds. If a message has not been received by the drive's Ethernet port within 20 seconds, the TCP connection will be terminated. To keep the connection open, consider sending an immediate command such as IP or IE to the drive every 10-15 seconds.*

RS-232 Setup

There are a few simple steps to serial communication between the stepper drive and LabVIEW.

1) Connect the ST5-Q-NN to a COM port.

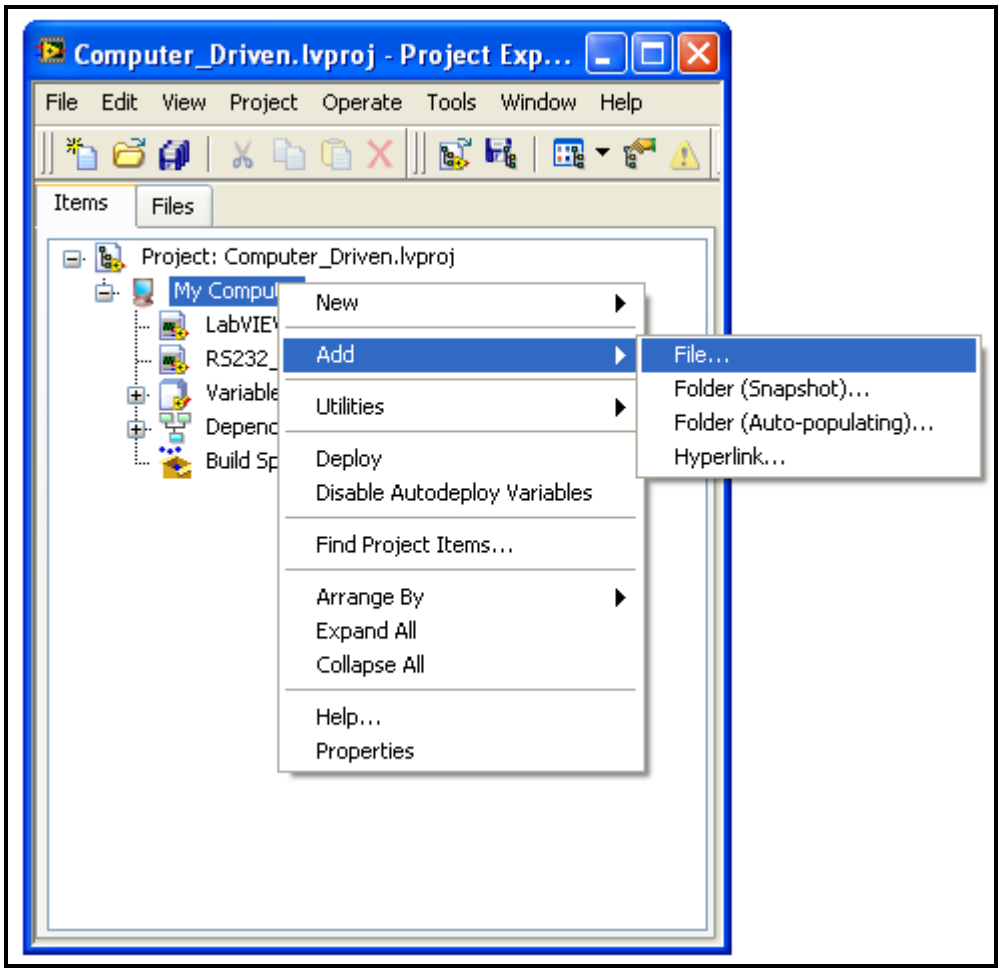


Figure 8: Adding files in LabVIEW

2) Under My Computer, find and add the RS232_Comm.vi that came in the ZIP folder with this application note.

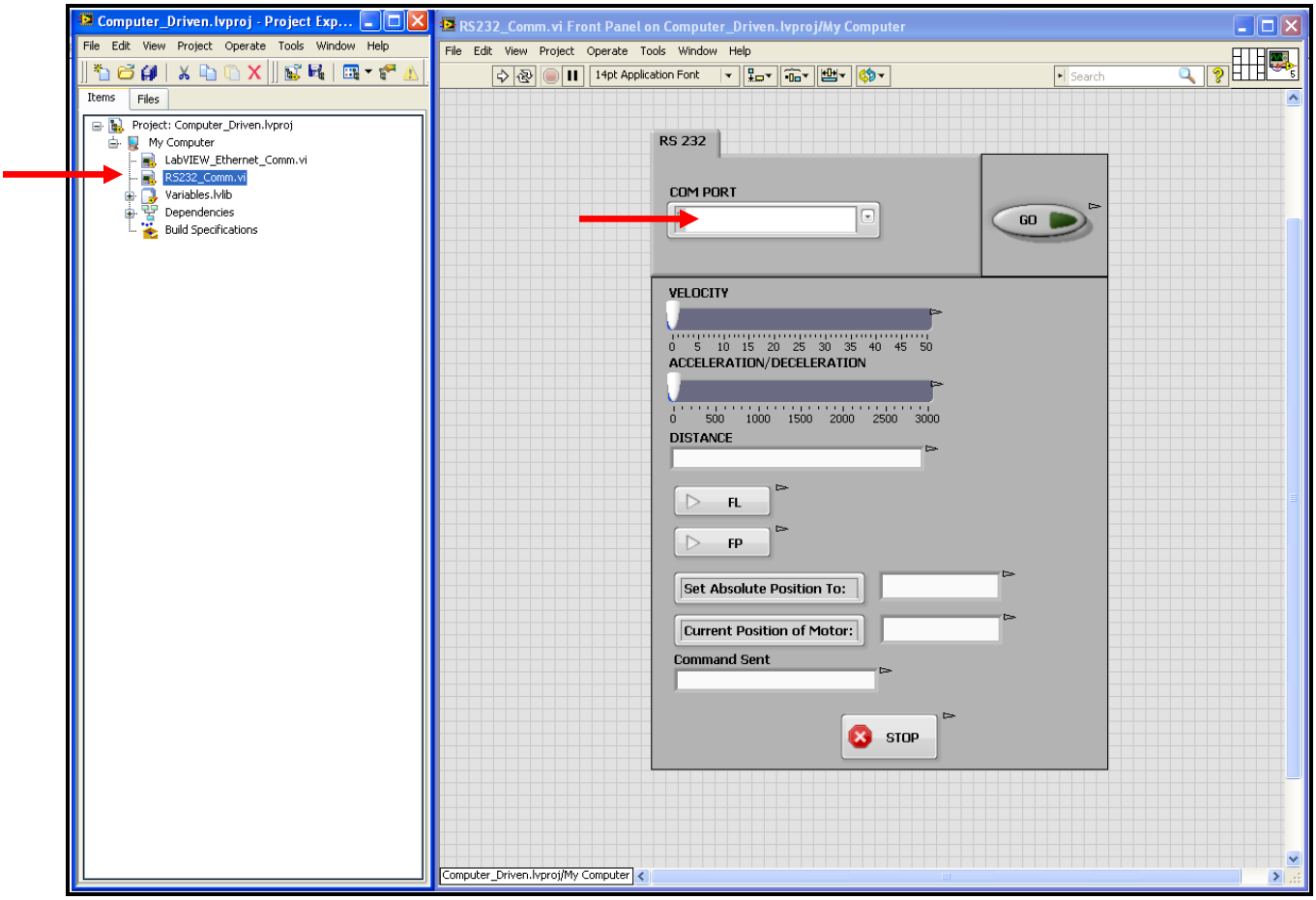


Figure 9: Sample LabVIEW user interface for RS-232 communication

2) Open up the 'RS232_Comm' VI and select the COM port you connected the stepper drive to using the field indicated by the red arrow in Fig. 9.

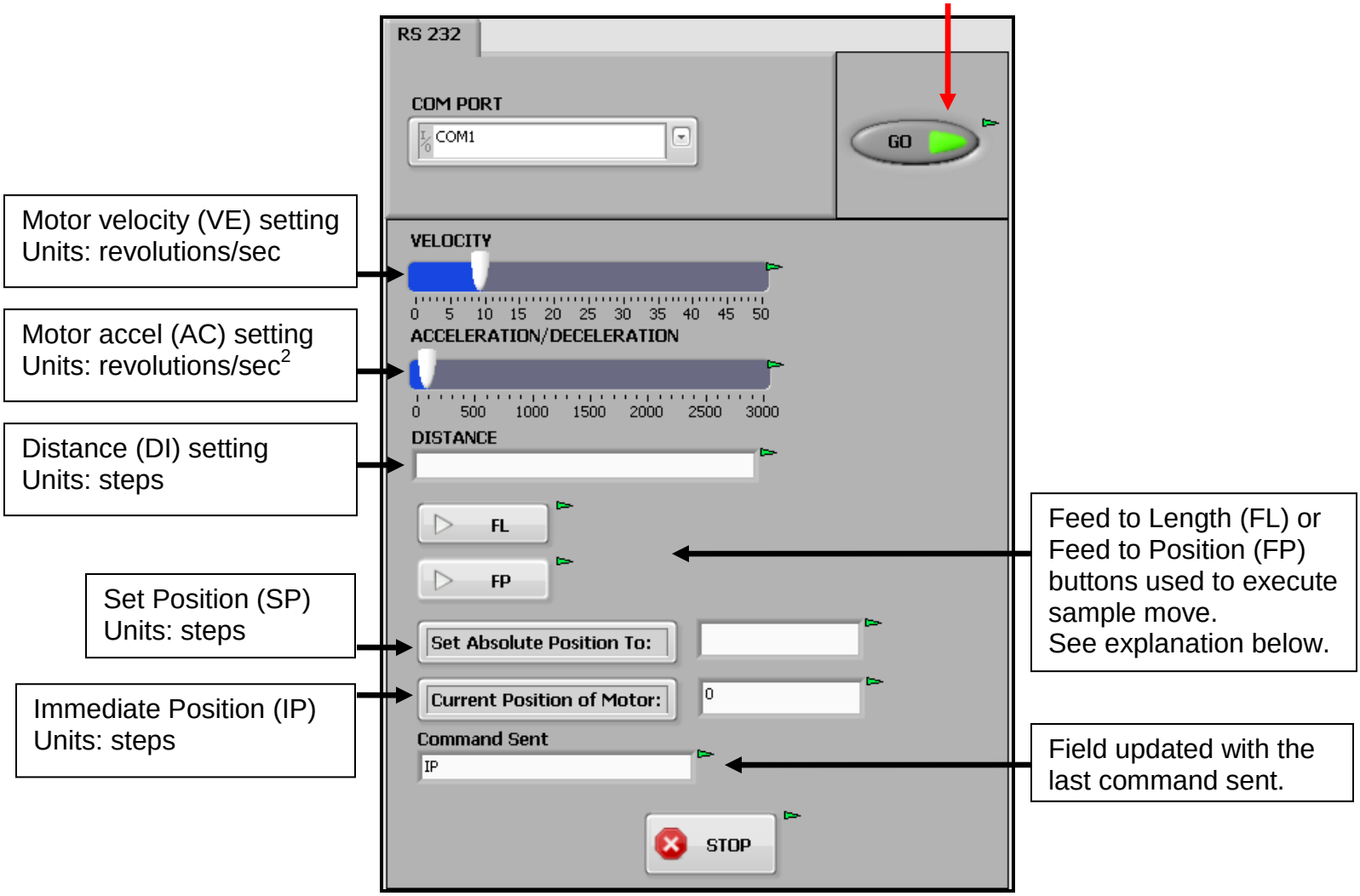


Figure 10: Sample graphical user interface for RS-232 communication

3) Run the VI. If a serial connection is established, considering you have selected the COM port the drive is connected to, the "GO" button will light up green indicating that your drive is ready to receive SCL commands as indicated by the red arrow in Fig. 10.

NOTE #1: *One additional step that must be implemented for RS-232 communication when developing your own program is to set the Power up Mode of the drive to a value of 2 within the LabView application. This can be done by issuing 'PM2' to the drive from the LabVIEW program. The sample RS-232 VI that accompanies this application note sends the PM2 command.*

NOTE #2: *While connected to the ST Configurator™ software, the drive is automatically set to power-up mode 3 (PM=3). In order for the drive to revert back to the required PM2 setting, close the ST Configurator software and cycle power to the drive to reset the DSP.*

NOTE #3: *Do not have ST Configurator™ open when running the RS232_Comm VI. LabVIEW will generate the following error:*

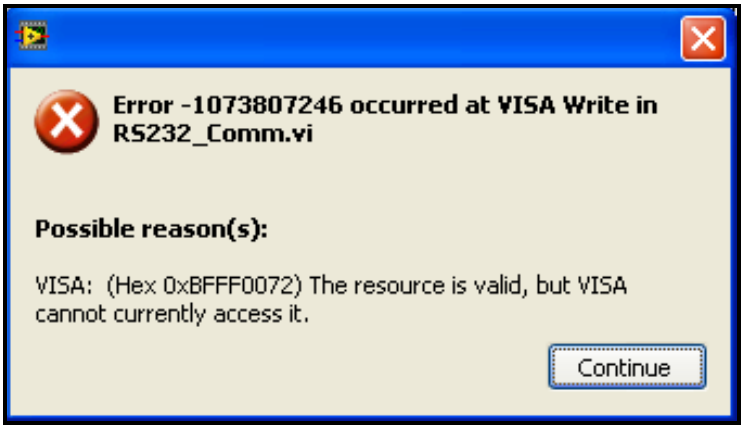


Figure 11: LabVIEW Serial Communication Error

RS-485 applications

While RS-422/485 is also supported on products from Applied Motion, it is not specifically addressed in this application note or sample LabVIEW files. Each RS-485 unit must be configured first with the appropriate Applied Motion software with its own address before being connected to the network. Refer to the appropriate hardware and software manuals for more information.

User Interface and SCL descriptions

Velocity (VE)
This slider control sets the target velocity using the VE command.
The VE command is used to set the target velocity in rev/sec.

Acceleration/Deceleration (AC & DE)
This slider control sets both the acceleration and deceleration of the sample move by using the AC and DE commands. The AC command is used to set the acceleration rate in rev/sec^2 and the DE command is used to set the deceleration rate in rev/sec^2.

Distance
The Distance entry is used to set the DI parameter in units of motor steps. This determines the length of the sample move. The default step resolution setting for an Applied Motion SCL drive is 20,000 steps/revolution. This can be changed using the EG command (see Host Command Reference for more details on this command).

Feed to Length (FL)
The FL button executes a relative move using the VE, AC, DE, and DI values described above. The motion will be incremental, adding the present Distance value to the current position of the motor.

Feed to Position (FP)
The FP button executes an absolute move using the VE, AC, DE, and DI values described above. The motion will be with respect to the absolute position counter within the drive, which is displayed in the 'Current Position of Motor' field.

Set Absolute Position To
The 'Set Absolute Position To' field is used to define a new absolute position using the EP and SP commands.

Current Position of Motor
This read-only field displays the current absolute position of the motor.

Command Sent
This read-only field displays the last command that was sent to the drive.

For more details on the SCL commands used, refer to the Host Command Reference manual, which is available at www.Applied-Motion.com.

Sample Code

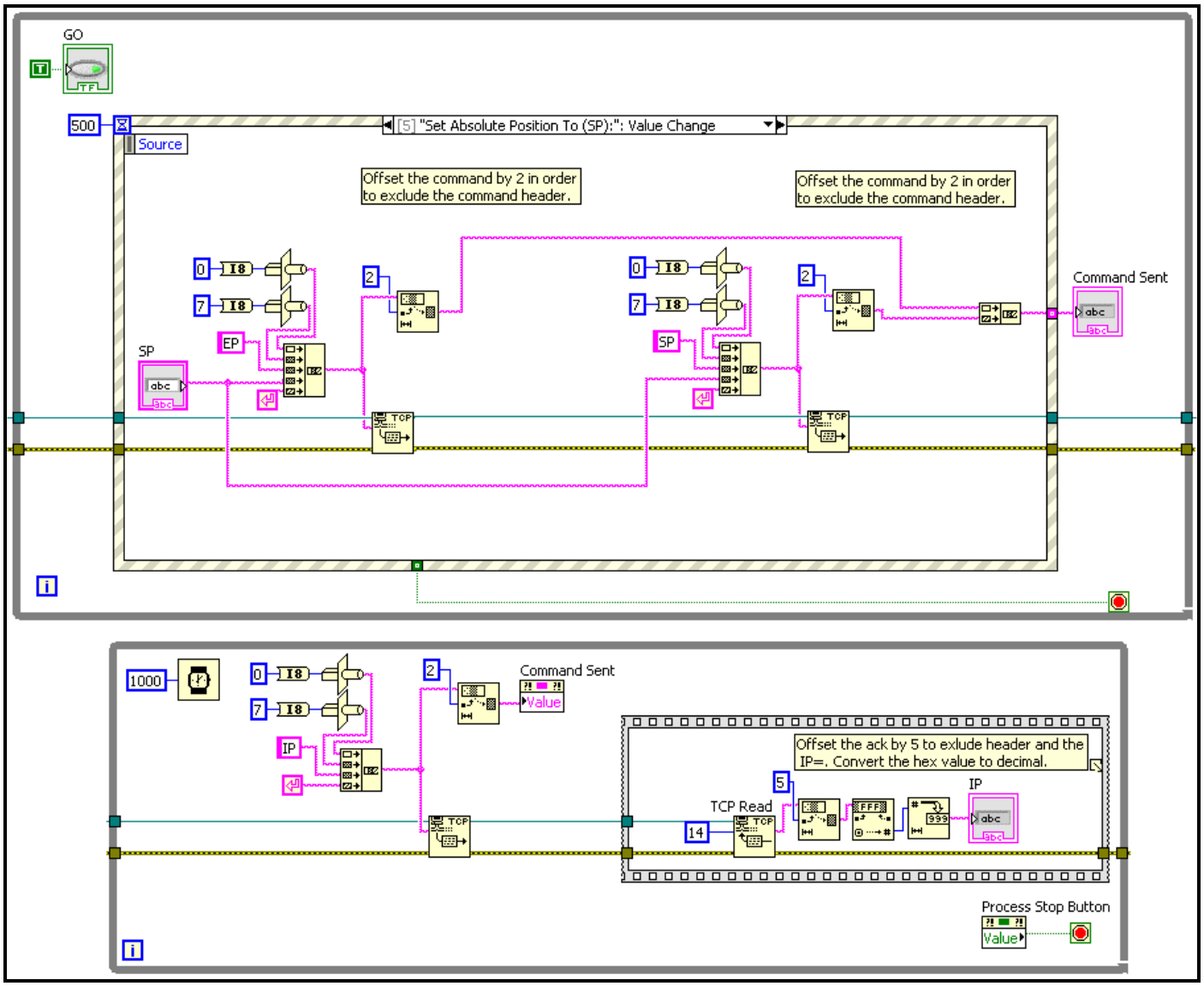


Figure 12: LabVIEW Ethernet Communication VI

The above code is specific to Ethernet communication. However, the serial communication code is similar with the only differences being that the TCP functions are replaced with VISA functions and the commands are sent without a header, just the two-letter command and a carriage return.

The top while loop allows for the event structure to keep monitoring any value changes in the UI front panel controls. If any UI control values are changed, it triggers an event and the appropriate handle to that event will execute. To view all of the events handled, click the drop-down list at the

top of the event structure. For example, if a value is entered into the “Set Absolute Position To:” string control in the UI, the “SP” event code above will execute sending a packet in the format specified in Appendix G of the Host Command Reference. Note, EP command is sent previous to the SP command as suggested in the Host Command Reference.

The lower while loop requests the present absolute position of the motor every second and updates the “Current Position of Motor:” string control.

For more examples on LabVIEW Serial Communication, please refer to http://zone.ni.com/devzone/cda/epd/p/id/2669

For more examples on LabVIEW TCP Communication, please refer to http://www.ni.com/white-paper/2710/en/.

For information on Applied Motion Products, please visit: http://www.applied-motion.com/