ICS ELECTRONICS
division of Systems West Inc.

IEEE 488

APPLICATION BULLETIN

USING LABVIEW WITH ICS's GPIB to PARALLEL INTERFACES

INTRODUCTION

The purpose of this application note is to demonstrate the use of LabView ™ to control ICS's various GPIB to Parallel Interfaces. This Application Note describes how to use LabView with the Model 4863 but it also applies to the Models 4803, 4823B and 4813 OEM Interface Cards.

PARALLEL INTERFACE REVIEW

ICS's GPIB to Parallel Interfaces have several address modes and methods that the user can use to transfer data to the 8-bit bidirectional data ports that make up the 4863's parallel interface. The simplest method is for the user to directly address a port and read data from the port or write data to that port. Data transferred in this method is only 8-bit wide words and the addressed ports are physically set as inputs or outputs when the command is executed. The CONFIGure command is not used to set the port direction for the port commands. The user can separately set the data polarity for each port.

A more advanced data transfer method is to use the CONFIGure command to configure one or more ports together as inputs or outputs to create 8, 16, 24 or wider data words. Data is transferred to or from these configured ports as strings. The user can use the CONFIGure command to set the data format, data polarity, handshaking etc.

The GPIB to Parallel Interfaces have three address modes for transferring data. The address modes are: Single Primary Address, Dual Primary Address and a Single Primary Address with Dual Secondary Addresses. In all three address modes, data can be transferred as a parameter in a command. The 4863's parser parses the command and routes the data to the selected port or configured output bytes. Read commands read data from a selected port or from configured input bytes. If the 4863 is addressed at the upper address in either dual address mode, data is transferred transparently, without a command, between the GPIB bus and the configured input or output bytes. The transparent data transfer methods are faster since they do not include a command that needs to be parsed.

OVERVIEW

The LabView ™ library files ((commonly referred to as drivers) discussed in this Application Note deal with just the 4863 and their purpose is to demonstrate how to control the 4863's parallel interface. However, the VIs for a real application should to consider the 4863 and the connected device(s) or circuits as one entity. The user should plan the Parallel Interface to device connections and how the overall entity will work before starting work on the sub-VIs

e.g.   If you are designing a GPIB controlled coffee grinder, it is better and more useful to create a VI that sets fine, medium or coarse grind vs one that sets three numeric values like 0x01, 0x02 and 0x04. Both VIs may output three binary values to a port but the first VI is far clearer to use.

The example drivers in this Application Note implement many of the commonly used 4863 functions and can be easily edited to provide additional features. With one exception they may all be used as sub-VIs in building your LabView application. Each sub-VI's function is described along with any applicable cautions that may apply to its use. To make best use of these drivers we recommend the user familiarize themselves with the contents of the Instruction Manual for your GPIB to Parallel Interface We also recommend you use the Configuration Program supplied with the unit or the GPIBkybd program to configure the device for your specific application.

4863 SETUP AND CONFIGURATION

For the purpose of these VIs, the 4863 has been configured for the Dual Address Mode of operation to demonstrate both commanded and transparent data transfer. If your application does not use transparent data transfer, leave the 4863's Address Mode set to Single.

Bytes 1 and 2 are reserved for Digital Input. The VIs assume Bytes 3,4,5, and 6 can be configured as either inputs or outputs. Hence all VIs that show a "First Port and Last Port" selection limit the user to a range of 3 - 6. This can be changed in LabView™ through the normal "Data Range" parameter setup from the front panel. To simplify application development, the LabView VIs and Sub-VIs were written in their simplest form without the VISA layer. The default Hex format is used for these VIs and in the examples for both Talk and Listen operations.

This Application Note provides 7 executable files that demonstrate the following capabilities:

   IDN
   Digital_Input_Status
   Read_a_Byte.vi
   Write_a_Byte.vi
   Config_Input_Ports.vi
   Output_Example_1
   Output_Example_2

These files are available from ICS's site. They will run on any Windows PC with LabView or with the LabView Run Time Engine (RTE) installed and a compatible GPIB Controller. Copies of the Run Time Engine can also be downloaded from ICS's website. The GPIB Controller can be a PCI card that installs internally in the PC, a PCMCIA card or a USB GPIB Controller Module.

Note: To simplify application development, the LabView VIs and Sub-VIs were written in their simplest form without the VISA layer.

REQUIRED HARDWARE AND SOFTWARE:

PC running Windows 95/98/ME/2000 or XP
LabView ™Version 5. 1 or Higher
ICS Electronics Model 4863, 4803, 4823B or 4813
        GPIB to Parallel Interface
ICS Electronics GPIB Interface Card (or equivalent)

To run only the demo files you do not need the full version of LabView ™. Simply install a copy of the RTE from ICS on your GPIB equipped PC and save the executable files in a convenient location on your hard drive. Note that LabView RTEs only go back 2 generations so users with LabView version 6.1 or later will have to save the demonstration VIs as current version VIs prior to running them.

REFERENCE DOCUMENTS

   ICS Electronics Model 4863 or 4803/4823B/4813
        Instruction Manual
   National Instrument LabView Programming Guide.

WHAT IS IN THE VIRTUAL INSTRUMENT (VI) LIBRARY

Top Level VIs

Change_ADDR_Mode.vi
Use this VI to change the default address and address mode. For practical reasons the range for the base address is restricted to 1 - 29. This allows the dual address mode to function properly with two consecutive GPIB primary addresses. Use this VI when the you want to reassign the 4863's default GPIB address. The same task may also be accomplished using the configuration software supplied with the 4863. CAUTION: **Do not** place this VI in a continuous loop. This VI uses the *SAV 0 command which saves data in the 4863's Flash Memory. Repeated writes to the Flash Memory can damage the Flash IC.

IDN. VI
Use this VI to query the 4863's identification message. Table 3-1 of the Interface's Instruction Manual shows the correct response. Use ICS's GPIBkybd program or another interactive GPIB control program to customize the IDN message for your application.

Digital_Input_Status.vi
This VI reads the status of the Questionable Condition Register. With no inputs applied to Bytes 1 & 2 the correct response to running this VI would be a numerical 32,768. This is because all digital inputs are pulled high. We recommend you assign your input channels to bytes 1 and 2 as outlined in the 4863 Instruction Manual.

Read_a_Byte.vi
Use this VI to Read a selected Byte. Data is transferred using the 4863's lower GPIB address. Data direction for the selected port is set when the command is executed.

Write_a_Byte.vi

Use this VI to Write to a selected Byte. This VI is format sensitive. If you change the format be sure to adjust your VI data controls accordingly. Data is transferred using the 4863's lower GPIB address. Data direction for the selected port is set when the command is executed.

Config_Input_Ports.vi

Use this VI to configure the selected Ports to Input. The default range is Ports 3,4,5, & 6. Ports must be configured as inputs before they can be read with a string command.

Config_Output_Ports.vi

Use this VI to configure the selected Ports to Output. The default range is Ports 3,4,5, & 6. Ports must be configured as outputs before they can be written to with a string command.

Output_Example_1.vi

This VI serves as an example of outputting multiple sets of bytes to selected ports. It uses the standard SCPI command strings and the lower GPIB address. Data used in this example is "Format" sensitive. (See also ICS Electronics Application Note AB-20A)

Output_Example_2.vi

This VI serves as an example of outputting multiple sets of bytes to selected ports. It transfers data transparently to the 4863's upper GPIB address. Data used in this example is "Format" sensitive. (See also ICS Electronics Application Note AB-20A)

ICS 4863 Wait. VI

Use this sub-VI after every GPIB command to allow the bus a chance to respond to each command or query. The default is arbitrarily set for 150 ms. It can be set for shorter delays if timing is important to your application.

POWER TURN-ON CONFIGURATION

At power turn-on time or when reset, the 4863 sets its Parallel Interface to its last saved configuration. The power-on defaults for new 4863s is set by writing any configuration commands for the application to the 4863 followed by outputting the desired power turn-on values to the output ports. The current configuration is then saved by writing the *SAV 0 command to the 4863

SUMMARY

This application note has described a collection of LabView™ VIs that can be used to control an ICS GPIB to Parallel Interface. This note applies to all of ICS's GPIB to Parallel Interfaces (Models 4863, 4803, 4823B and 4803.). The user can intersperse these VIs in his or her program as needed to make a complete test program. The user should adapt these VIs by modifying them to control his application rather than use then in their raw form to simply control the 4863's parallel ports. The subject LabView VIs and the revision 5.1 Run Time Engine can be downloaded from the Support Menu on ICS Electronics' website at http://www.icselect.com/. Look for the 4863_labview.zip file.