APPLICATION NOTES

4D SYSTEMS
TURNING TECHNOLOGY INTO ART

ViSi-Genie Writing to Genie Objects Using an Arduino Host

DOCUMENT DATE: 13th April 2019
DOCUMENT REVISION: 1.1

Description

This Application Note explores the possibilities provided by the ViSi-Genie environment in Workshop to work with an Arduino host. In this example, the host is an AVR ATmega328 microcontroller-based Arduino Uno board. The host can also be an Arduino Mega 2560 or Due. Ideally, the application described in this document should work with any Arduino board with at least one UART serial port. See specifications of Aduino boards here.

Before getting started, the following are required:

- Any of the following 4D Picaso display modules:

uLCD-24PTU	uLCD-28PTU	uVGA-III
gen4-uLCD-24PT	gen4-uLCD-28PT	gen4-uLCD-32PT

- The target module can also be a Diablo16 display

gen4-uLCD-24D Series	gen4-uLCD-28D Series	gen4-uLCD-32D Series
gen4-uLCD-35D Series	gen4-uLCD-43D Series	gen4-uLCD-50D Series
gen4-uLCD-70D Series		
uLCD-35DT	uLCD-43D Series	uLCD-70DT

See the section "Write to a Pin Output Object" when compiling this project for a Diablo16 display module.

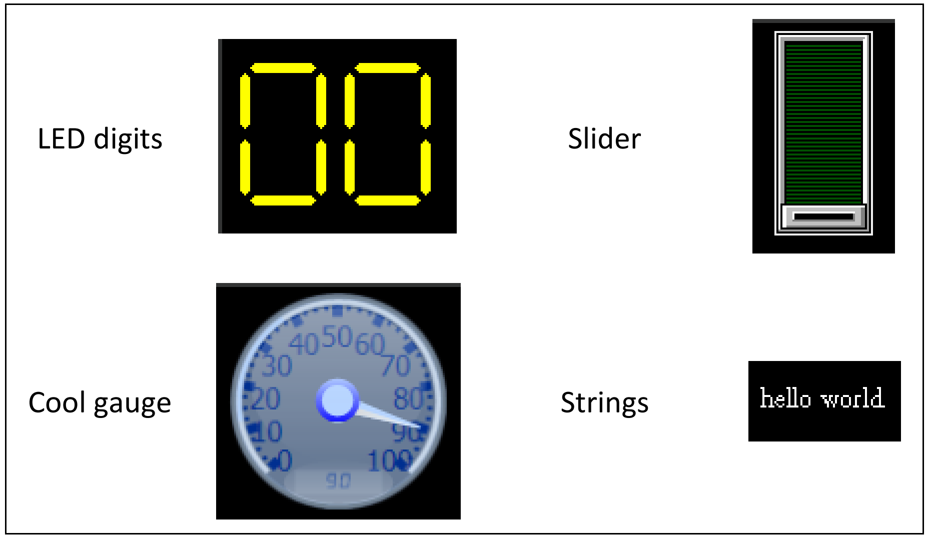
Visit www.4dsystems.com.au/products to see the latest display module products that use the Diablo16 processor. The display module used in this application note is the uLCD-32PTU, which is a Picaso display. This application note is applicable to Diablo16 display modules as well.

- 4D Programming Cable / µUSB-PA5/µUSB-PA5-II for non-gen4 displays (uLCD-xxx)
- 4D Programming Cable & gen4-IB / gen4-PA / 4D-UPA, for gen-4 displays (gen4-uLCD-xxx)
- micro-SD (µSD) memory card
- Workshop 4 IDE (installed according to the installation document)
- When downloading an application note, a list of recommended application notes is shown. It is assumed that the user has read or has a working knowledge of the topics presented in these recommended application notes.

Content

Application Overview

It is often difficult to design a graphical display without being able to see the immediate results of the application code. ViSi-Genie is the perfect software tool that allows users to see the instant results of their desired graphical layout with this large selection of gauges and meters (called widgets) that can simply be dragged and dropped onto the simulated module display. The following are some examples of widgets or objects used in this application note.



This document is a supplement to ViSi-Genie Connecting a 4D Display to an Arduino Host. The application of the Genie class member function **`WriteObject()`** function to different Genie objects is shown here. A ViSi-Genie program and an Arduino sketch are provided for demonstration purposes.

The ViSi Genie program contains the different objects created in Workshop. The Arduino sketch contains the commands to control each of these objects. To learn how to create a ViSi Genie program, go to http://www.4dsystems.com.au/appnotes/. The page contains application notes which explain how to create and configure objects in a ViSi-Genie program.

Setup Procedure

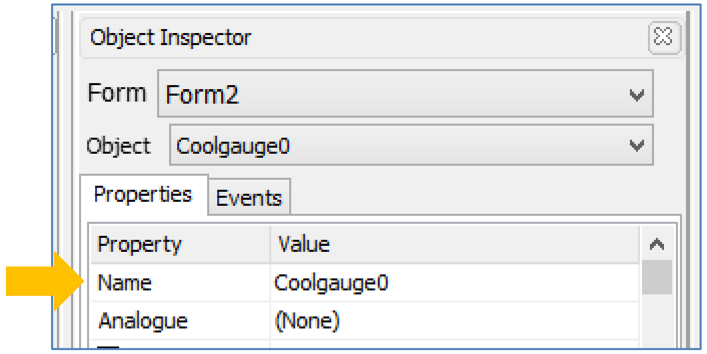
For instructions on how to launch Workshop 4, how to open a ViSi-Genie project, and how to change the target display, kindly refer to the section "**Setup Procedure**" of the application note:

ViSi Genie Getting Started – First Project for Picaso Displays (for Picaso)
or
ViSi Genie Getting Started – First Project for Diablo16 Displays (for Diablo16).

Writing to Genie Objects Using and Arduino Host

Naming of Objects

When creating objects in the Workshop IDE, objects are automatically named as they are created. For instance, the first cool gauge object added will be given the name Coolgauge0. The object name, along with the object properties, is shown by the Object Inspector.

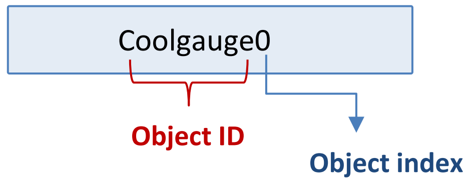

Object Inspector

Form: Form2

Object: Coolgauge0

Property	Value
Name	Coolgauge0
Analogue	(None)

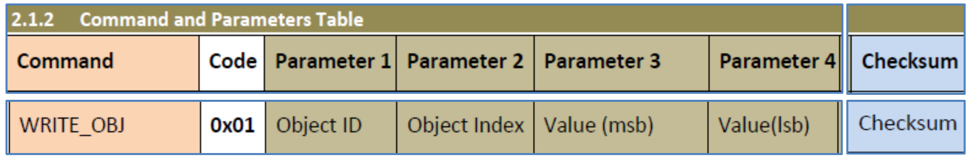
Naming is important to differentiate between objects of the same kind. For example, suppose the user adds another cool gauge object to the WYSIWYG (What-You-See-Is-What-You-Get) screen. This object will be given the name Coolgauge1 – it being the second cool gauge in the program. The third cool gauge will be given the name Coolgauge2, and so on. An object's name therefore identifies its kind and its unique index number. It has an ID (or type) and an index.



It is important to take note of an object's ID and index. When programming in the Arduino IDE, an object's status can be polled or changed if its ID and index are known, as will be shown in the next section.

Writing to an Object

The status of a ViSi-Genie object can be controlled or changed by a host controller with the appropriate message sent thru the serial port. The format of this message is defined in the ViSi Genie Communications Protocol which is discussed in the ViSi Genie User Reference Manual. To write to a ViSi-Genie object, the format is:



2.1.2 Command and Parameters Table

Command	Code	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Checksum
WRITE_OBJ	0x01	Object ID	Object Index	Value (msb)	Value(lsb)	Checksum

The ViSi-Genie-Arduino library implements this format as a function, the prototype for which is declared under the Genie class.

```
WriteObject (uint16_t object,
             uint16_t index, uint16_t data);
```

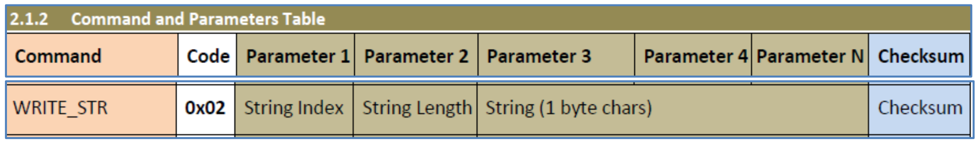
The first parameter must be an integer which specifies the object ID. The second parameter is an integer which specifies the index of the object. The third parameter is an integer which holds the data to be written to the object. Example:

```
genie.WriteObject(GENIE_OBJ_COOL_GAUGE, 0x00, gaugeVal);
```

Note that the third parameter must be an integer. Floats and other data types cannot be passed as an argument to this function. The Arduino platform provides functions for converting floats to integers. The user can refer to the Arduino website for further information.

Writing to a String Object

String objects can display predefined text (created in the ViSi-Genie environment) or dynamic text received from the host. The process of making a string object display predefined text is discussed in the section **"Write to a Predefined Strings Object"**. For the host to write a dynamically created text to a string object, the format of the message is:



2.1.2 Command and Parameters Table

Command	Code	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter N	Checksum
WRITE_STR	0x02	String Index	String Length	String (1 byte chars)			Checksum

The function prototype for this in the ViSi-Genie-Arduino library is:

```
WriteStr    (uint16_t index, char *string);
```

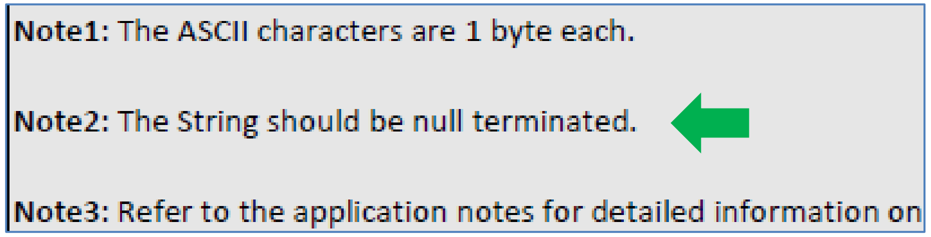
The first parameter is the index of the string. The second parameter is a pointer to a null-terminated character array. Examples:

```
#define        GENIE_VERSION    "GenieArduino 31-Mar-2014"
genie.WriteStr(0, GENIE_VERSION);
```

```
char myArray[6] = {'h', 'e', 'l','l','o','\0'};
genie.WriteStr(0, myArray);
```

```
char myArray2[] = "Welcome to 4D Systems!";
genie.WriteStr(0, myArray2);
```

Note that for all three examples, the second argument for `genie.WriteStr()` is a pointer to a null-terminated character array. Section 2.1.3.3 Write String (ASCII) Message of the ViSi-Genie Reference Manual emphasizes this.


Note1: The ASCII characters are 1 byte each.

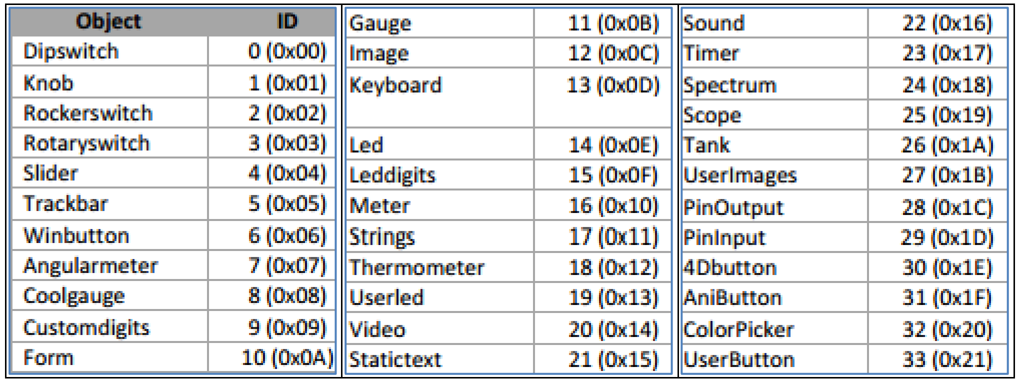
Note2: The String should be null terminated.

Note3: Refer to the application notes for detailed information on

It is a common mistake for beginners to use integers, strings, floats, and other data types instead of a pointer to a null-terminated character array as the second argument passed to **`genie.WriteStr()`** . The Arduino platform provides functions for converting integers, strings, and floats to null-terminated character arrays. The user can refer to the Arduino website for further information.

The ViSi-Genie Arduino library handles the actual communication between the Arduino host and the display module, making sure that the message sent is of the correct format. This also includes error checksum coding, acknowledgment, etc. The user will just have to specify the strings object index and the string to be displayed when using `genie.WriteStr()`.

The user can easily associate the syntax of the functions to the corresponding format in the ViSi-Genie Communications Protocol. Table 3.3 of the manual shows the objects and their ID numbers.



Object	ID	Gauge	11 (0x0B)	Sound	22 (0x16)
Dipswitch	0 (0x00)	Image	12 (0x0C)	Timer	23 (0x17)
Knob	1 (0x01)	Keyboard	13 (0x0D)	Spectrum	24 (0x18)
Rockerswitch	2 (0x02)			Scope	25 (0x19)
Rotaryswitch	3 (0x03)	Led	14 (0x0E)	Tank	26 (0x1A)
Slider	4 (0x04)	Leddigits	15 (0x0F)	UserImages	27 (0x1B)
Trackbar	5 (0x05)	Meter	16 (0x10)	PinOutput	28 (0x1C)
Winbutton	6 (0x06)	Strings	17 (0x11)	PinInput	29 (0x1D)
Angularmeter	7 (0x07)	Thermometer	18 (0x12)	4Dbutton	30 (0x1E)
Coolgauge	8 (0x08)	Userled	19 (0x13)	AniButton	31 (0x1F)
Customdigits	9 (0x09)	Video	20 (0x14)	ColorPicker	32 (0x20)
Form	10 (0x0A)	Statictext	21 (0x15)	UserButton	33 (0x21)

In the ViSi-Genie-Arduino library, the ID numbers are then used to define the Genie object constants.

GENIE_OBJ_DIPSW	0	GENIE_OBJ_THERMOMETER	18
GENIE_OBJ_KNOB	1	GENIE_OBJ_USER_LED	19
GENIE_OBJ_ROCKERSW	2	GENIE_OBJ_VIDEO	20
GENIE_OBJ_ROTARYSW	3	GENIE_OBJ_STATIC_TEXT	21
GENIE_OBJ_SLIDER	4	GENIE_OBJ_SOUND	22
GENIE_OBJ_TRACKBAR	5	GENIE_OBJ_TIMER	23
GENIE_OBJ_WINBUTTON	6	GENIE_OBJ_SPECTRUM	24
GENIE_OBJ_ANGULAR_METER	7	GENIE_OBJ_SCOPE	25
GENIE_OBJ_COOL_GAUGE	8	GENIE_OBJ_TANK	26
GENIE_OBJ_CUSTOM_DIGITS	9	GENIE_OBJ_USERIMAGES	27
GENIE_OBJ_FORM	10	GENIE_OBJ_PINOUTPUT	28
GENIE_OBJ_GAUGE	11	GENIE_OBJ_PININPUT	29
GENIE_OBJ_IMAGE	12	GENIE_OBJ_4DBUTTON	30
GENIE_OBJ_KEYBOARD	13	GENIE_OBJ_ANIBUTTON	31
GENIE_OBJ_LED	14	GENIE_OBJ_COLORPICKER	32
GENIE_OBJ_LED_DIGITS	15	GENIE_OBJ_USERBUTTON	33
GENIE_OBJ_METER	16		
GENIE_OBJ_STRINGS	17		

The following sections now show how the **genie.WriteObject()** function is applied to different Genie objects. Writing to the keyboard, static text, image, and pin input objects is not possible.

Write to a DIP Switch

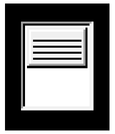
To write to a DIP switch:

```
genie.WriteObject(GENIE_OBJ_DIPSW, 0x00, 0);
delay(3000);
```

A three-second delay is added for the observer to see the object at the current state. Note that the function has three arguments as defined in the ViSi-Genie-Arduino library. The first argument is the Genie object to be written to, the second is the object index, and the third is the value which represents the state of the DIP switch. Thus, the command

```
genie.WriteObject(GENIE_OBJ_DIPSW, 0x00, 0);
delay(3000);
```

yields the result

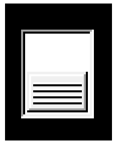


State 0

The command

```
genie.WriteObject(GENIE_OBJ_DIPSW, 0x00, 1);
delay(3000);
```

yields the result



State 1

Table 2.1.2 shows the format for writing to objects.

2.1.2 Command and Parameters Table

Command	Code	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Checksum
WRITE_OBJ	0x01	Object ID	Object Index	Value (msb)	Value(lsb)	Checksum

For further information, refer to the ViSi Genie User Reference Manual. The document gives an informative description of all of the Genie objects in relation to the ViSi Genie communications protocol.

Write to a Knob

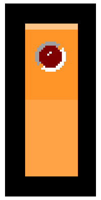
```
//write to a knob
genie.WriteStr(0, "Knob0 at \nvarious states");
for(i = 0; i<100; i++){
  genie.WriteObject(GENIE_OBJ_KNOB, 0x00, i);
  delay(100);
}
```

The code above will make Knob0 change its state from 0 to 99, hence making it appear to rotate.

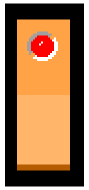
Write to a Rocker Switch

```
//write to a rockerswitch
genie.WriteStr(0, "Rockerswitch0 at 0");
genie.WriteObject(GENIE_OBJ_ROCKERSW, 0x00, 0);
delay(3000);
genie.WriteStr(0, "Rockerswitch0 at 1");
genie.WriteObject(GENIE_OBJ_ROCKERSW, 0x00, 1);
delay(3000);
```

Similar to the DIP switch example, the code above displays the rocker switch at state 0 and then at state 1.



State 0



State 1

Write to a Rotary Switch

```
//write to a rotary switch
genie.WriteStr(0, "Rotaryswitch0 at\n various states");
for(i = 0; i<9; i++){
  genie.WriteObject(GENIE_OBJ_ROTARYSW, 0x00, i);
  delay(350);
}
```

The code above will make Rotaryswitch0 change its state from 0 to 8. To learn how to configure a rotary switch, refer to ViSi-Genie Inputs.

Write to a Slider

```
//write to a slider
genie.WriteStr(0, "Slider0 at \nvarious states");
for(i = 0; i<100; i++){
  genie.WriteObject(GENIE_OBJ_SLIDER, 0x00, i);
  delay(100);
}
```

Similar to the knob example, the code above will make Slider0 change its state from 0 to 99.

Write to a Track Bar

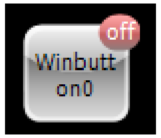
```
//write to a trackbar
genie.WriteStr(0, "Trackbar0 at \nvarious states");
for(i = 0; i<100; i++){
  genie.WriteObject(GENIE_OBJ_TRACKBAR, 0x00, i);
  delay(100);
}
```

The code above will make Trackbar0 change its state from 0 to 99.

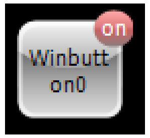
Write to a Winbutton

```
//write to a winbutton
genie.WriteStr(0, "Winbutton0 at 0");
genie.WriteObject(GENIE_OBJ_WINBUTTON, 0x00, 0);
delay(3000);
genie.WriteStr(0, "Winbutton0 at 1");
genie.WriteObject(GENIE_OBJ_WINBUTTON, 0x00, 1);
delay(3000);
```

Similar to the DIP switch example, the code will show Winbutton0 at state 0 and then at state 1.



State 0



State 1

The button used in this example is configured as a toggle button. ViSi-Genie Advanced Buttons explains how to create a toggle button.

Navigate to a New Form

```
//navigate to Form1
genie.WriteObject(GENIE_OBJ_FORM, 0x01,0);
genie.WriteStr(1, "This is now \nForm1");
```

The second parameter, 0x01 is the index of the form to be activated. The third argument can be of any value since the Genie communications protocol does not require a value (MSB and LSB). See section 3.2.6.1 of the ViSi Genie User Reference Manual.

Write to an Angular Meter

```
//write to an angular meter
genie.WriteStr(1, "Angularmeter0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_ANGULAR_METER, 0x00, i);
delay(100);}
```

The code above will make Angularmeter0 change its state from 0 to 99.

Write to a Cool Gauge

```
//write to a cool gauge
genie.WriteStr(2, "Coolgauge0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_COOL_GAUGE, 0x00, i);
delay(100);}
```

The code above will make Coolgauge0 change its state from 0 to 99.

Write to a Custom Digits

```
//write to a custom digit
genie.WriteStr(3, "Customdigits0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_CUSTOM_DIGITS, 0x00, i);
delay(100);}
```

The code above will make Customdigits0 change its state from 0 to 99. To learn how to create a custom digits object, open the ViSi sample program in Workshop under File menu – Samples – Picaso ViSi – CLOCK. The block comment discusses how the bitmap image of the digits was created.

Write to a Gauge

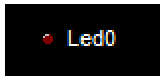
```
//write to a gauge
genie.WriteStr(3, "Gauge0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_GAUGE, 0x00, i);
delay(100);}
```

The code above will make Gauge0 change its state from 0 to 99.

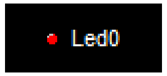
Write to an LED

```
//write to an LED
genie.WriteStr(3, "Led0 at 0");
genie.WriteObject(GENIE_OBJ_LED, 0x00, 0);
delay(3000);
genie.WriteStr(3, "Led0 at 1");
genie.WriteObject(GENIE_OBJ_LED, 0x00, 1);
delay(3000);
```

Similar to the DIP switch example, the code above displays the LED at state 0 and then at state 1.



State 0



State 1

Write to a LED Digits

```
//write to a LED digits
genie.WriteStr(3, "Leddigits0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_LED_DIGITS, 0x00, i);
delay(100);}
```

The code above will make Leddigits0 change its state from 0 to 99.

Write to a Thermometer

```
//write to a thermometer
genie.WriteStr(4, "Thermometer0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_THERMOMETER, 0x00, i);
delay(100);}
```

The code above will make Thermometer0 change its state from 50 to 149. Note that the value sent by the Arduino host is offset by 50. The user has to account for this offset.

Write to a Meter

```
//write to a meter
genie.WriteStr(4, "Meter0 at \nvarious states");
for(i = 0; i<100; i++){
genie.WriteObject(GENIE_OBJ_METER, 0x00, i);
delay(100);}
```

The code above will make Meter0 change its state from 0 to 99.

Write to a User LED

```
//write to a user LED
genie.WriteStr(5, "Userled0 at 0");
genie.WriteObject(GENIE_OBJ_USER_LED, 0x00, 0);
delay(3000);
genie.WriteStr(5, "Userled0 at 1");
genie.WriteObject(GENIE_OBJ_USER_LED, 0x00, 1);
delay(3000);
```

The code above displays the Userled0 at state 0 and then at state 1.

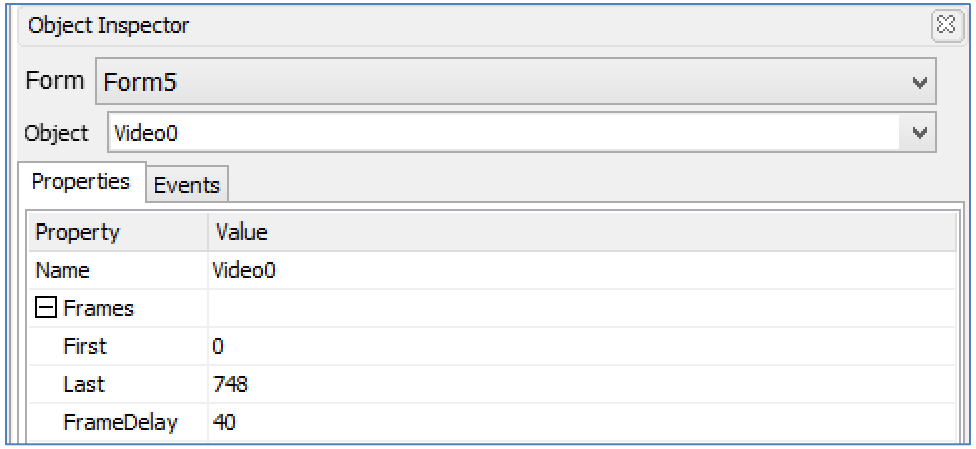
State 0

State 1

Write to a Video

```
//write to a video
genie.WriteStr(5, "display the different \nframes of Video0");
for(i = 0; i<749; i++){
genie.WriteObject(GENIE_OBJ_VIDEO, 0x00, i);
delay(40);}
```

The code above will play Video0. Take note of the frame values and delay. The Object Inspector shows the frame properties of a video.


Object Inspector

Form Form5

Object Video0

Properties Events

Property	Value
Name	Video0
⊟ Frames	
First	0
Last	748
FrameDelay	40

The FrameDelay (milliseconds) is equal to the reciprocal of the frame rate (fps).

Write to a Predefined Strings Object

Besides displaying a dynamically created ASCII text received from the Arduino host, the user also has the option of displaying a predefined strings object created in the Workshop IDE. The document ViSi-Genie Labels, Text, and Strings discusses how predefined strings objects are created. Using predefined values makes the most efficient use of the communication link and also minimizes the code required in the host controller. In the ViSi Genie sample program, Strings6 contains four pages of text. Each of this page can be displayed by using the genie.WriteObject() function.

```
//write to a predefined strings object
genie.WriteStr(5, "Displaying a \npredefined\nstrings object
delay(5000);
genie.WriteStr(5, "page 1 of Strings6\nis intentionally\nlef
genie.WriteObject(GENIE_OBJ_STRINGS, 0x06, 0);
delay(3000);
genie.WriteStr(5, "page 2 of Strings6");
genie.WriteObject(GENIE_OBJ_STRINGS, 0x06, 1);
delay(7000);
genie.WriteStr(5, "page 3 of Strings6");
genie.WriteObject(GENIE_OBJ_STRINGS, 0x06, 2);
delay(7000);
genie.WriteStr(5, "page 4 of Strings6");
genie.WriteObject(GENIE_OBJ_STRINGS, 0x06, 3);
delay(7000);
```

Note that genie.WriteStr( ) is for displaying a dynamically created string (from the host), while genie.WriteObject( ) is for displaying a predefined string (stored in the uSD card).

Write to a Timer

A timer object created in the Workshop IDE can be started or stopped by the host controller using the appropriate commands. Form0 of the ViSi Genie program has a timer object, Timer0, linked to Video1. When Timer0 starts, Video1 plays. Note that timer and sound objects always reside in Form0.

```
//write to a timer
genie.WriteStr(7, "Start Timer0");
genie.WriteObject(GENIE_OBJ_TIMER, 0x00,1);
delay(5000);
genie.WriteStr(7, "Stop Timer0");
genie.WriteObject(GENIE_OBJ_TIMER, 0x00,0);
delay(5000);
genie.WriteStr(7, "Timer0 resumes");
genie.WriteObject(GENIE_OBJ_TIMER, 0x00,1);
delay(5000);
genie.WriteStr(7, "Timer0 stops");
genie.WriteObject(GENIE_OBJ_TIMER, 0x00,0);
genie.WriteObject(GENIE_OBJ_VIDEO, 0x01,0); //rese
delay(5000);
```

Write to a Sounds Object

The sounds object is a special object such that there can only be one instance of it in a Genie program. Similar to the timer object, the sounds object is invisible and always resides in Form0. The document ViSi-Genie Play Sound explains how to create and control a sounds object. Section 3.2.6.4 of the ViSi Genie User Reference Manual explains how to control a sounds object when using a host controller. The code below shows how this is done when programming an Arduino host. The ViSi Genie program for this code has a Sounds object containing three tracks.

```
//start playing track 1
genie.WriteStr(8, "Play track 1");
genie.WriteObject(GENIE_OBJ_SOUND, 0x00,0);
//set volume
genie.WriteStr(9, "volume = 100");
genie.WriteObject(GENIE_OBJ_SOUND, 0x01,100);
delay(7000);

//start playing track 2
genie.WriteStr(8, "Play track 2");
genie.WriteObject(GENIE_OBJ_SOUND, 0x00,1);
//control volume
genie.WriteStr(9, "volume = 75");
genie.WriteObject(GENIE_OBJ_SOUND, 0x01,75);
delay(7000);
//pause current track (track 2)
genie.WriteStr(8, "Pause track 2");
genie.WriteObject(GENIE_OBJ_SOUND, 0x02,0);//t
delay(3000);
//resume current track (track 2)
genie.WriteStr(8, "Continue \ntrack 2");
genie.WriteObject(GENIE_OBJ_SOUND, 0x03,0);//t
delay(5000);
//stop current track (track 2). Track goes bac
genie.WriteStr(8, "Stop track 2");
genie.WriteObject(GENIE_OBJ_SOUND, 0x04,0);//t
delay(3000);
```

```
//start playing track 3
genie.WriteStr(8, "Play track 3");
genie.WriteObject(GENIE_OBJ_SOUND, 0x00,2);
genie.WriteStr(9, "volume = 100");
genie.WriteObject(GENIE_OBJ_SOUND, 0x01,100);
delay(7000);
//stop current track (track 3). Track goes ba
genie.WriteStr(8, "Stop track 3");
genie.WriteObject(GENIE_OBJ_SOUND, 0x04,0);//
delay(3000);
```

The user is encouraged to open the accompanying Arduino sketch file and read the comments.

Write to a Spectrum Object

The spectrum object is described with more detail in ViSi-Genie Spectrum.

```
for(i = 0; i < 250; i++){
  bar = random(0, 23);
  value = random(0,99);
  combined = (bar << 8) | value;
  genie.WriteObject(GENIE_OBJ_SPECTRUM, 0x00, combined);
  delay(20);
}
```

Write to a Scope Object

The scope object is described in ViSi-Genie Single Trace Scope.

```
for(i = 0; i < 263; i++){
  genie.WriteObject(GENIE_OBJ_SCOPE, 0x00, random(0, 160));
  delay(50);
}
```

Write to a Tank Object

The tank object is documented in ViSi-Genie Tank.

```
for(i = 0; i < 100; i++){
  genie.WriteObject(GENIE_OBJ_TANK, 0x00, i);
  genie.WriteObject(GENIE_OBJ_LED_DIGITS, 0x01, i);
  delay(50);
}
```

Write to a User Images Object

The user images object is documented in ViSi-Genie User Images.

```
for(i = 0; i < 10; i++){
  j = random(0, 3);
  genie.WriteObject(GENIE_OBJ_USERIMAGES, 0x00, j);
  genie.WriteObject(GENIE_OBJ_USERIMAGES, 0x01, i);
  delay(1000);
}
```

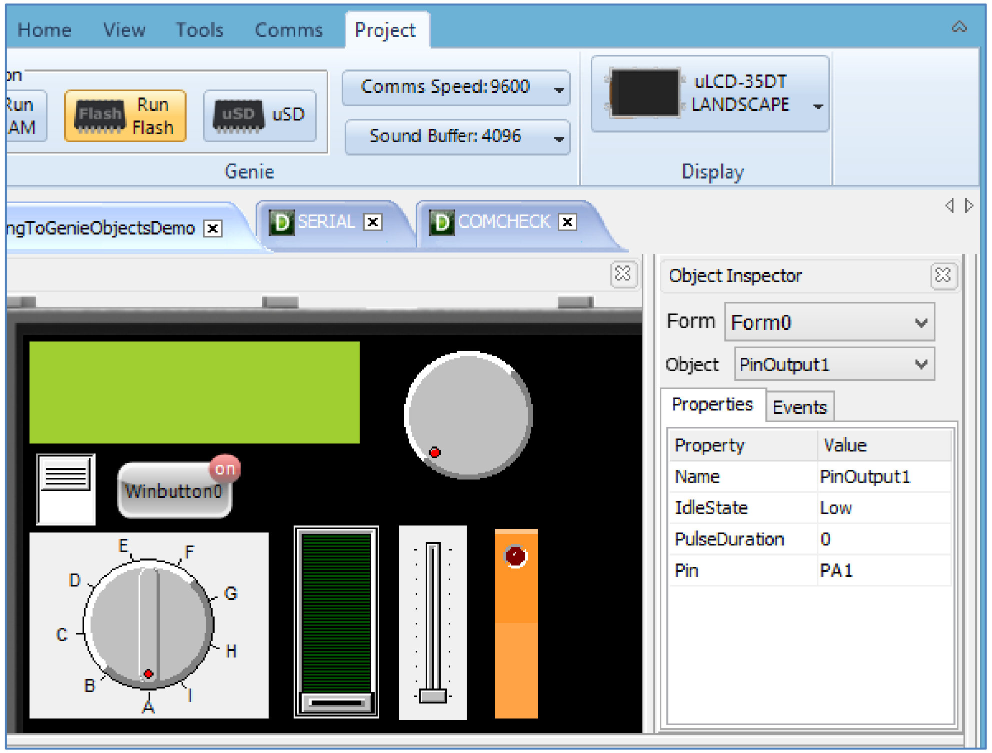
Write to a Pin Output Object

The pin output object is described in ViSi-Genie Pin Input and Output.

```
for(i = 0; i < 10; i++){
  genie.WriteObject(GENIE_OBJ_PINOUTPUT, 0x00, random(0,1));
  genie.WriteObject(GENIE_OBJ_USER_LED, 0x01, 1);
  delay(1000);
  genie.WriteObject(GENIE_OBJ_USER_LED, 0x01, 0);
  delay(1000);

  genie.WriteObject(GENIE_OBJ_PINOUTPUT, 0x01, j);
  genie.WriteObject(GENIE_OBJ_USER_LED, 0x02, j);
  delay(50);
  j = !j;
}
```

Note that the pin labels of a Picaso display module are different from those of a Diablo16 display. Since the ViSi-Genie project attached to this application note was designed using a Picaso display, it has to be modified if recompiled for a Diablo16 display. Reconfigure the pin assignment of a pin output object by using the object inspector. For a uLCD-35DT target display for example, refer to the following images.



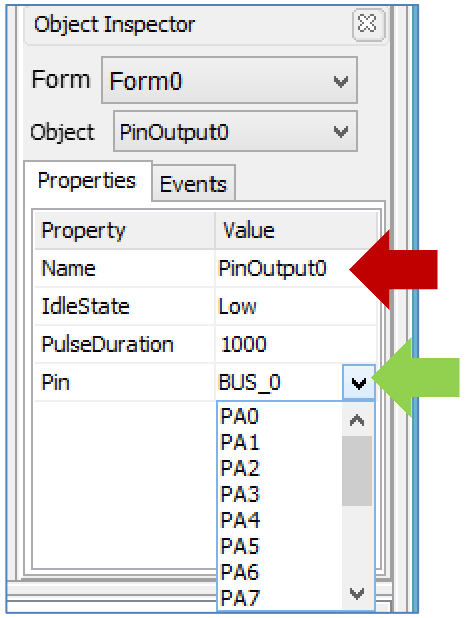
Object Inspector

Form: Form0

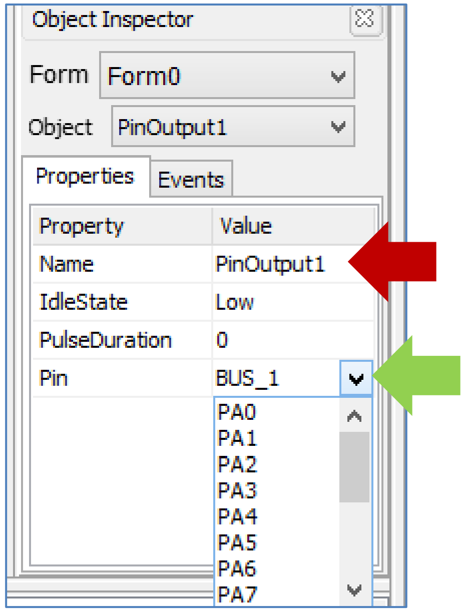
Object: PinOutput1

Properties | Events

Property	Value
Name	PinOutput1
IdleState	Low
PulseDuration	0
Pin	PA1



Property	Value
Name	PinOutput0
IdleState	Low
PulseDuration	1000
Pin	BUS_0



Property	Value
Name	PinOutput1
IdleState	Low
PulseDuration	0
Pin	BUS_1

BUS_0 is a pin label for Picaso displays. Change the pin assignment of PinOutput0 by choosing a new pin label from the new list provided for Diablo16 displays. Do the same for PinOutput1. Failure to perform these steps will result to a compilation error. Refer to the datasheet of your display for more information.

Write to a 4D Button Object

The 4D button object is described in ViSi-Genie 4D Buttons.

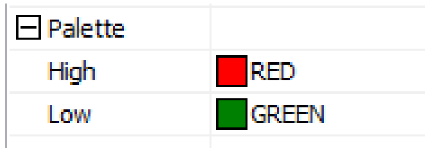
```
for(j = 0; j < 4; j++){
  genie.WriteObject(GENIE_OBJ_4DBUTTON, i, 1);
  delay(100);
  genie.WriteObject(GENIE_OBJ_4DBUTTON, i, 0);
  delay(100);
}
```

Write to an Animated Button Object

The animated button object is described in ViSi-Genie Animated Button.

```
for(j = 0; j < 5; j++){
  genie.WriteObject(GENIE_OBJ_ANIBUTTON, 0x00, j);
  delay(100);
}
```

In the following example, the LED is red when on or high; and green when off or low:



⊟ Palette	
High	🟥 RED
Low	🟩 GREEN

Write to a Colour Picker Object

The colour picker object is described in ViSi-Genie Color Picker.

```
for(j = 0; j < 10; j++){
  i = random(0, 0xFFFF);
  genie.WriteObject(GENIE_OBJ_COLORPICKER, 0x00, i);
  delay(500);
}
```

Write to a User Button Object

The colour picker object is described in ViSi-Genie User Button.

```
for(j = 0; j < 10; j++){
  genie.WriteObject(GENIE_OBJ_USERBUTTON, 0x00, j & 0x01);
  genie.WriteObject(GENIE_OBJ_USERBUTTON, 0x01, j & 0x01);
  delay(500);
}
```

Proprietary Information

Disclaimer of Warranties & Limitation of Liability