A-8111

Software Manual
[For Windows 95/98/NT]

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1. Hardware Guide

1.1 A-8111

The A-8111 is a multifunction, 12-bit resolution A/D, D/A and digital I/O card. The feature of the A-8111 are given as below:

- A/D=12 bits, 8 channels(differential)
- A-8111 : gain 1/2/4/8/16
- DA=12 bits, 1 channels, 0-5V or 0-10V output by **hardware JP1 setting**
- 16 channels TTL compatible digital input
- 16 channels TTL compatible digital output

1.2 Range Configuration Code

The AD converter of A8111 is 12 bits under all configuration code. If the analog input range is configured to +/- 5V range, the resolution of one bit is equal to 2.44 mV. If the analog input range is configured to +/- 2.5V range, the resolution will be 1.22 mV. If the analog input signal is about 1 V, use configuration 0/1/2/3/4 (for A8111) will get nearly the same result **except resolution. So choose the correct configuration code can achieve the highest precision measurement.**

A-8111 Input Signal Range Configuration Code Table

Bipolar/Unipolar	Input Signal Range	Configuration Code
Bipolar	+/- 5V	0
Bipolar	+/- 2.5V	1
Bipolar	+/- 1.25V	2
Bipolar	+/- 0.625V	3
Bipolar	+/- 0.3125V	4

2. Introduction

The **A8111** has a collection of DLLs for Windows 95/98/NT application. These DLLs are 32 bits and can be called by Visual C/C++, Borland C++, Visual BASIC, Delphi, and LabVIEW.

The A8111 consists of these DLLs and device driver:
For Windows 95/98

• A8111.dll	→ Libraries
• A8111.Vxd	→ Device driver for Windows 95/98

For Windows NT

• A8111.dll	→ Libraries
• A8111.sys	→ Device driver for Windows NT
• Napwnt.sys	→ Device driver for Windows NT

These DLLs can perform a variety of data acquisition operations as follows:

- Get software version
- Initialization
- Digital Input/Output
- A/D , D/A conversion

2.1 Software Installation

A). The CD Disk Contents:

```
    |--\Win95
    |     |--\README.TXT
    |     |--\SETUP
    |           |--\Setup.exe       ← the Setup program for WINDOWS 95/98
    |
    |--\WinNT
          |--\README.TXT
          |--\SETUP
                |--\Setup.exe       ← the Setup program for Windows NT
```

B). Installation Steps

Step 1). Insert 'A8111 Setup CD' into CD-ROM.
Step 2). Clicking Start/Run in the task Bar
Step 3). Enter the path as:

E:\Win95\Setup\Setup.exe (for Win 95/98,CD-ROM drive is E:)
E:\WinNT\Setup\Setup.exe (for Win NT, CD-ROM drive is E:)

Step 4). Following those instructions in installation process to complete it.

After installed,
Windows 95/98:

The A8111.DLL, A8111.Vxd will be copied into C:\Windows\SYSTEM.

Windows NT:

The A8111.DLL will be copied into C:\WinNT\system32,
The A8111.sys and Napwnt.sys will be copied into
C:\WinNT\system32\drivers

C). After installed, the sub-directory tree as follows:

For Windows 95/98:

```
[Base Directory] ← the directory you selected to setup
        |--\Demo
        |      |--\VB5          ← demo code of Visual Basic 5.0
        |      |--\VC5          ← demo code of Visual C++ 5.0
        |      |--\Delphi3      ← demo code of Delphi 3.0
        |      |--\BCB3         ← demo code of Borland C++ Builder 3.0
        |
        |--\Diag
        |      |--\Diag.exe     ← Diagnostic Program
        |
        |--\Driver              ← Device driver & DLL for Win95/98
        |      |--\A8111.dll    ← Dynamic linking library for A8111
        |      |--\A8111.Vxd    ← Virtual Device Driver for Win95/98
        |
        |--\Manual              ← User's manual
        |      |--\A8111sof.pdf ← the software manual
        |      |--\CallDLL.pdf  ← Call the DLL functions with VB5, Delphi3
        |      |                    BCB3 and VC 5.
        |      |--\ResCheck.pdf ← Check the resource (I/O Port, IRQ, DMA)
        |      |                    under Windows 95/98 and NT
        |      |--\SoftInst.pdf ← Install the software
        |
        |--\readme.txt
```

For Windows NT:

```
[Base Directory] ← the directory you selected to setup
          |--\Demo
          |       |--\VB5           ← demo code of Visual Basic 5.0
          |       |--\VC5           ← demo code of Visual C++
          |       |--\Delphi3       ← demo code of Delphi 3.0
          |       |--\BCB3          ← demo code of Borland C++ Builder 3.0
          |
          |--\Diag
          |       |--\Diag.exe      ← Diagnostic Program
          |
          |--\Driver                ← Device driver & DLL for Win NT
          |       |--\A8111.dll     ← dynamic linking library for A8111
          |       |--\A8111.sys     ← Virtual Device Driver for Win NT
          |       |--\NapWnt.sys    ← Virtual Device Driver for Win NT
          |
          |--\Manual                ← User's manual
          |       |--\A8111sof.pdf  ← the software manual
          |       |--\CallDLL.pdf   ← Call the DLL functions with VB5, Delphi3
          |       |                    BCB3 and VC 5.
          |       |--\ResCheck.pdf  ← Check the resource (I/O Port, IRQ, DMA)
          |       |                    under Windows 95/98 and NT
          |       |--\SoftInst.pdf  ← Install the software
          |
          |--\readme.txt
```

Note:

These VC++ demos are developed with VC++ 5.0. Please setup the environment exactly. Then using the NMAKE.EXE to compiling/linking the demo code. For examples: \DEMO\VC5\nmake /f demo1.mak

2.2 References

Please refer to the following user manuals:

- **SoftInst.pdf:**
  Describes how to install the software package under Windows 95/98/NT.

- **CallDll.pdf:**
  Describes how to call the DLL functions with VC++5, VB5, Delphi3 and Borland C++ Builder 3.

- **ResCheck.pdf:**
  Describes how to check the resources I/O Port address, IRQ number and DMA number for add-on cards under Windows 95/98/NT.

3. CALL DLLs & Demos

Please refer to user manual "CallDLL.pdf".

For Windows 95/98:

```
|--\Driver
      |  |--\A8111.DLL      <-- Dynamic Linking Library
      |  |--\A8111.sys      <-- device driver
      |  |--\Napwnt.sys     <-- device driver
      |  |
      |  |--\BCB            <-- for Borland C++ Builder
      |  |  |--\A8111.h     <-- Header file
      |  |  |--\A8111.Lib   <-- Import Library for BCB only
      |  |
      |  |--\Delphi         <-- for Delphi
      |  |  |--\A8111.Pas   <-- Declaration file
      |  |
      |  |--\VB             <-- for Visual Basic
      |  |  |--\A8111.BAS   <-- Declaration file
      |  |
      |  |--\VC             <-- for Visual C++
      |     |--\A8111.h     <-- Header file
      |     |--\A8111.Lib   <-- Import Library for VC only
```

For Windows NT:

```
|--\Driver
      |  |--\A8111.DLL      <-- Dynamic Linking Library
      |  |--\A8111.sys      <-- device driver
      |  |--\Napwnt.sys     <-- device driver
      |  |
      |  |--\BCB            <-- for Borland C++ Builder
      |  |  |--\A8111.h     <-- Header file
      |  |  |--\A8111.Lib   <-- Import Library for BCB only
      |  |
      |  |--\Delphi         <-- for Delphi
      |  |  |--\A8111.Pas   <-- Declaration file
      |  |
      |  |--\VB             <-- for Visual Basic
      |  |  |--\A8111.BAS   <-- Declaration file
      |  |
      |  |--\VC             <-- for Visual C++
      |     |--\A8111.h     <-- Header file
      |     |--\A8111.Lib   <-- Import Library for VC only
```

3.1 Using Visual C++

The entire demo program given in the companion floppy disk is designed with C language. It is testing under Windows 95/98/NT and Visual C++ 5.0 compiler. The key points are given as below :

1. Make sure the PATH include the Visual C++ compiler
2. Execute the \MSDEV\BIN\VCVARS32.BAT to setup the environment. The VCVARS32.BAT is provided by Visual C++.
3. The source program must include “A8111.H”
4. Copy the A8111.LIB, import library, to the directory where same as source program.
5. Copy the A8111.DLL, to the directory where same as source program
6. Edit the source program (refer to \Demo\VC5\DEMO1.C)
7. (refer to \Demo\VC5\DEMO1.C)
8. Edit the NMAKE file (refer to \Demo\VC5\DEMO1.MAK) (refer to \Demo\VC5\DEMO1.MAK)
9. NMAKE /f DEMO1.MAK
10. Execute DEMO1.EXE

NOTE: The **A8111.lib is used in linking time** and the **A8111.DLL is used in run time.**

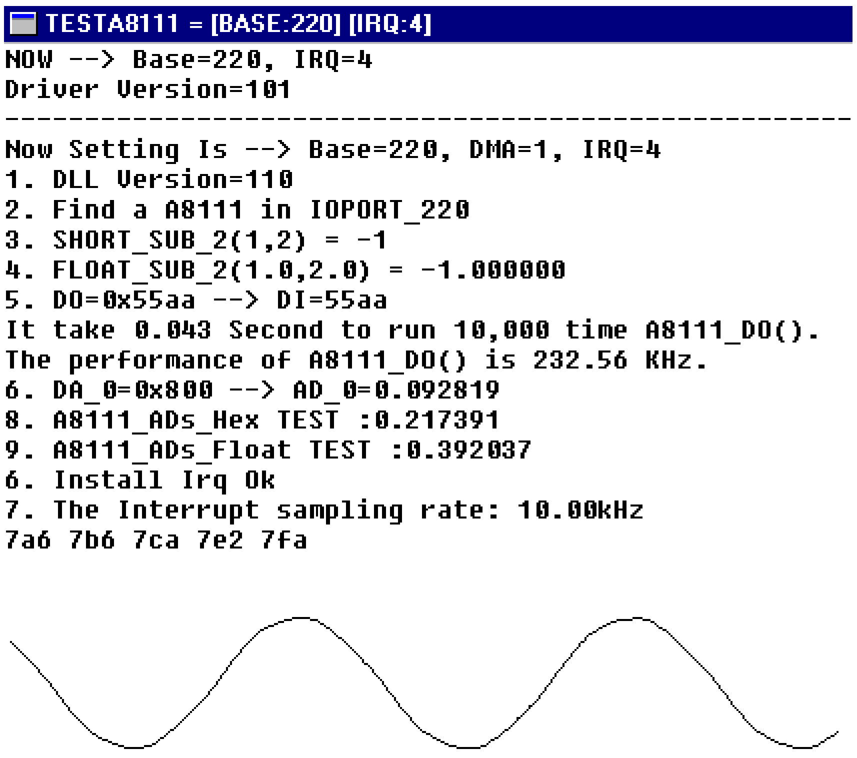
3.2 Using MFC

The usage of A8111 for MFC user is very similar to that for C user. It tests OK under Windows 95/98/NT and Visual C++ 5.0. The key points are given as below:

1. Use MFC wizard to create source code
2. The source program must include “A8111.H”
3. Copy the A8111.LIB, import library, to the directory same as source program
4. Copy the A8111.DLL, to the directory same as source program
5. Select **Build/Settings/Link** and key “A8111.lib” in the **object/library modules** field

NOTE: The **A8111.lib is used in linking time** and the **A8111.DLL is used in run time.**

3.2.1 VC++ Demo Result



```
NOW --> Base=220, IRQ=4
Driver Version=101
-----------------------------------------------------
Now Setting Is --> Base=220, DMA=1, IRQ=4
1. DLL Version=110
2. Find a A8111 in IOPORT_220
3. SHORT_SUB_2(1,2) = -1
4. FLOAT_SUB_2(1.0,2.0) = -1.000000
5. DO=0x55aa --> DI=55aa
It take 0.043 Second to run 10,000 time A8111_DO().
The performance of A8111_DO() is 232.56 KHz.
6. DA_0=0x800 --> AD_0=0.092819
8. A8111_ADs_Hex TEST :0.217391
9. A8111_ADs_Float TEST :0.392037
6. Install Irq Ok
7. The Interrupt sampling rate: 10.00kHz
7a6 7b6 7ca 7e2 7fa
```

Fig. 1.

3.2.2 A8111.h for VC++

```
#ifdef __cplusplus
    #define EXPORTS extern "C" __declspec (dllimport)
#else
    #define EXPORTS
#endif

/**************** DEFINE A8111 RELATIVE ADDRESS ****************/
#define A8111_TIMER0          0x00
#define A8111_TIMER1          0x01
#define A8111_TIMER2          0x02
#define A8111_TIMER_MODE      0x03
#define A8111_AD_LO           0x04   /* Analog to Digital, Low Byte */
#define A8111_AD_HI           0x05   /* Analog to Digital, High Byte */
#define A8111_DA_CH0_LO       0x04   /* Digit to Analog, CH 0 */
#define A8111_DA_CH0_HI       0x05
#define A8111_DA_CH1_LO       0x06   /* Digit to Analog, CH 1 */
#define A8111_DA_CH1_HI       0x07
#define A8111_DI_LO           0x06   /* Digit Input */
#define A8111_DO_LO           0x0D    /* Digit Output */

#define A8111_CLEAR_IRQ       0x08
#define A8111_SET_GAIN        0x09
#define A8111_SET_CH          0x0A
#define A8111_SET_MODE        0x0B
#define A8111_SOFT_TRIG       0x0C

#define A8111_POLLING_MODE       1
#define A8111_DMA_MODE           2
#define A8111_INTERRUPT_MODE     6

/*** define the gain mode ***/
#define A8111_BI_1               0
#define A8111_BI_2               1
#define A8111_BI_4               2
#define A8111_BI_8               3
#define A8111_BI_16              4
```

```
#define A8111_NoError                    0
#define A8111_DriverOpenError            1
#define A8111_DriverNoOpen               2
#define A8111_GetDriverVersionError      3
#define A8111_InstallIrqError            4
#define A8111_ClearIntCountError         5
#define A8111_GetIntCountError           6
#define A8111_GetBufferError             7
#define A8111_AdError1                   100
#define A8111_AdError2                   -200.0
#define A8111_InstallBufError            10
#define A8111_AllocateMemoryError        11
#define A8111_TimeoutError               0xffff
#define A8111_OtherError                 13

// Function of Test
EXPORTS short CALLBACK A8111_SHORT_SUB_2(short nA, short nB);
EXPORTS float CALLBACK A8111_FLOAT_SUB_2(float fA, float fB);
EXPORTS WORD  CALLBACK A8111_Get_DLL_Version(void);
EXPORTS WORD  CALLBACK A8111_GetDriverVersion(
      WORD *wDriverVersion);

// Function of DI/DO
EXPORTS WORD  CALLBACK A8111_DI(WORD wBase);
EXPORTS void  CALLBACK A8111_DO(WORD wBase, WORD wHexValue);
EXPORTS void  CALLBACK A8111_OutputByte(WORD wPortAddr,
      UCHAR bOutputVal);
EXPORTS void  CALLBACK A8111_OutputWord(WORD wPortAddr,
      WORD wOutputVal);
EXPORTS WORD  CALLBACK A8111_InputByte(WORD wPortAddr);
EXPORTS WORD  CALLBACK A8111_InputWord(WORD wPortAddr);

// Function of AD/DA
EXPORTS WORD  CALLBACK A8111_AD_Hex(WORD wBase,
      WORD wChannel, WORD wGainCode);
EXPORTS WORD  CALLBACK A8111_ADs_Hex(WORD wBase,
      WORD wChannel, WORD wGainCode , WORD wBuf[], WORD wCount);
EXPORTS float CALLBACK A8111_AD_Float(WORD wBase,
      WORD wChannel, WORD wGainCode);
EXPORTS WORD  CALLBACK A8111_ADs_Float(WORD wBase,
      WORD wChannel, WORD wGainCode, float fBuf[], WORD wCount);
EXPORTS WORD  CALLBACK A8111_ADsPacer_Float(WORD wBase,
      WORD wChannel, WORD wGainCode, float fBuf[], WORD wCount,
      WORD counter1, WORD counter2);
EXPORTS float CALLBACK A8111_AD2F(WORD wHex,
      WORD wGainCode );
EXPORTS void  CALLBACK A8111_DA(WORD wBase, WORD wHexValue);
EXPORTS void  CALLBACK A8111_Uni5_DA(WORD wBase, float fValue);
EXPORTS void  CALLBACK A8111_Uni10_DA(WORD wBase, float fValue);
```

```
// Function of Driver
EXPORTS WORD  CALLBACK A8111_DriverInit(void);
EXPORTS void  CALLBACK A8111_DriverClose(void);
EXPORTS WORD  CALLBACK A8111_DELAY(WORD wBase,
      WORD wDownCount);
EXPORTS WORD  CALLBACK A8111_Check_Address(WORD wBase);

// Function of Interrupt
EXPORTS WORD  CALLBACK A8111_Int_Install(WORD wBase,
      WORD wIrq, DWORD dwCount);
EXPORTS WORD  CALLBACK A8111_Int_Start(WORD wChannel,
      WORD wGainCode, WORD wCounter1, WORD wCounter2);
EXPORTS WORD  CALLBACK A8111_Int_Remove(void);
EXPORTS WORD  CALLBACK A8111_Int_GetCount(DWORD *dwVal);
EXPORTS WORD  CALLBACK A8111_Int_GetBuffer(DWORD dwNum,
      WORD wBuffer[]);
EXPORTS WORD  CALLBACK A8111_Int_GetFloatBuffer(DWORD dwNum,
      float fBuffer[]);
```

3.3 Using Visual Basic

3.3.1 VB Demo Result:

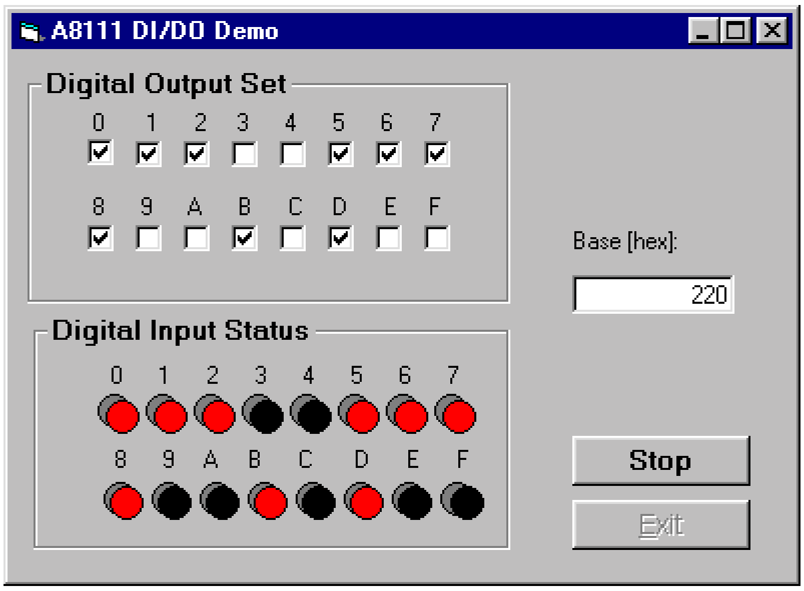


Fig. 2.

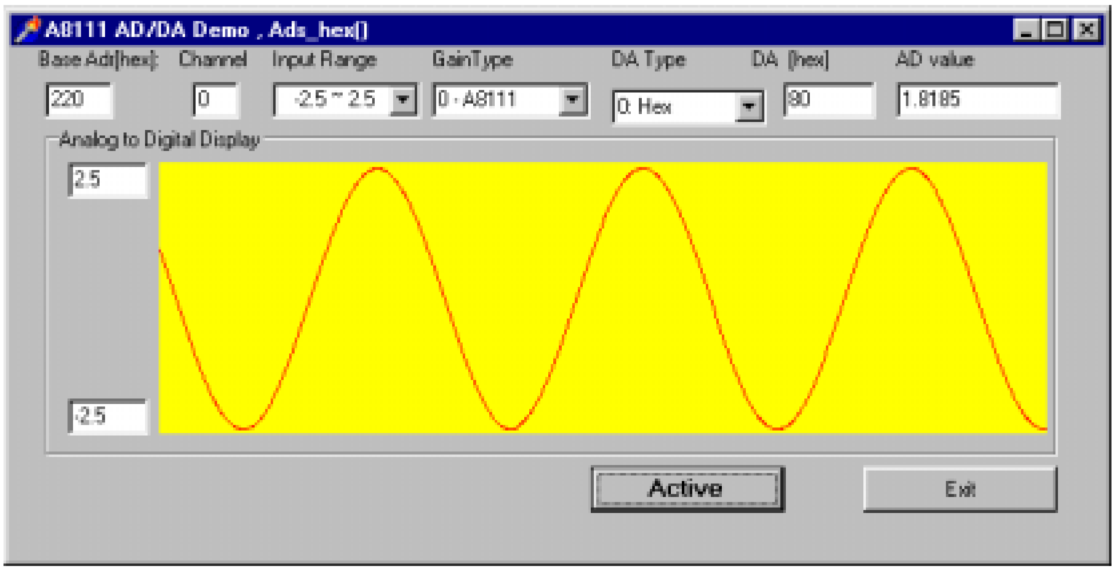
3.3.2 A8111.BAS

```
'********************************************************************************
'     The Declare of A8111.DLL for A8111 DAQ Card
'********************************************************************************

Declare Sub Sleep Lib "kernel32" (ByVal dwMilliseconds As Long)

'***************** DEFINE A8111 RELATIVE ADDRESS *****************
Global Const A8111_TIMER0        = &H0
Global Const A8111_Timer1        = &H1
Global Const A8111_TIMER2        = &H2
Global Const A8111_TIMER_MODE= &H3
Global Const A8111_AD_LO         = &H4   ' Analog to Digital, Low Byte */
Global Const A8111_AD_HI         = &H5   ' Analog to Digital, High Byte */
Global Const A8111_DA_CH0_LO  = &H4   ' Digit to Analog, CH 0 */
Global Const A8111_DA_CH0_HI   = &H5
Global Const A8111_DA_CH1_LO  = &H6   ' Digit to Analog, CH 1 */
Global Const A8111_DA_CH1_HI   = &H7
Global Const A8111_DI_LO         = &H6   ' Digit Input */
Global Const A8111_DO_LO         = &HD    ' Digit Output */

Global Const A8111_CLEAR_IRQ   = &H8
Global Const A8111_SET_GAIN     = &H9
Global Const A8111_SET_CH        = &HA
Global Const A8111_SET_MODE    = &HB
Global Const A8111_SOFT_TRIG   = &HC

Global Const A8111_POLLING_MODE        = 1
Global Const A8111_DMA_MODE            = 2
Global Const A8111_INTERRUPT_MODE    = 6

'*** define the gain mode ***
Global Const A8111_BI_1                     = 0
Global Const A8111_BI_2                     = 1
Global Const A8111_BI_4                     = 2
Global Const A8111_BI_8                     = 3
Global Const A8111_BI_16                    = 4

Global Const A8111_NoError                  = 0
Global Const A8111_DriverOpenError         = 1
Global Const A8111_DriverNoOpen            = 2
Global Const A8111_GetDriverVersionError  = 3
Global Const A8111_InstallIrqError          = 4
Global Const A8111_ClearIntCountError     = 5
Global Const A8111_GetIntCountError        = 6
Global Const A8111_GetBufferError           = 7
Global Const A8111_AdError1               = 100
Global Const A8111_AdError2               = -200#
Global Const A8111_InstallBufError        = 10
Global Const A8111_AllocateMemoryError    = 11
Global Const A8111_TimeoutError           = &Hffff
Global Const A8111_OtherError             = 13

' Function of Test
Declare Function A8111_SHORT_SUB_2 Lib "A8111.DLL" (
      ByVal nA As Integer, ByVal nB As Integer) As Integer
Declare Function A8111_FLOAT_SUB_2 Lib "A8111.DLL" (
      ByVal fA As Single, ByVal fB As Single) As Single
Declare Function A8111_Get_DLL_Version Lib "A8111.DLL" () As Integer
Declare Function A8111_GetDriverVersion Lib "A8111.DLL" (
      wDriverVersion As Integer) As Integer

' Function of DI/DO
Declare Function A8111_DI Lib "A8111.DLL" (ByVal wBase As Integer)
      As Integer
Declare Sub A8111_DO Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wHexValue As Integer)
Declare Sub A8111_OutputByte Lib "A8111.DLL" (
      ByVal wPortAddr As Integer, ByVal bOutputVal As Byte)
Declare Sub A8111_OutputWord Lib "A8111.DLL" (
      ByVal wPortAddr As Integer, ByVal wOutputVal As Integer)
Declare Function A8111_InputByte Lib "A8111.DLL" (
      ByVal wPortAddr As Integer) As Integer
Declare Function A8111_InputWord Lib "A8111.DLL" (
      ByVal wPortAddr As Integer) As Integer

' Function of AD/DA
Declare Function A8111_AD_Hex Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wChannel As Integer, ByVal wGainCode As Integer) As Integer
Declare Function A8111_ADs_Hex Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wChannel As Integer, ByVal wGainCode As Integer,
      wBuf As Integer, ByVal wCount As Integer) As Integer
Declare Function A8111_AD_Float Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wChannel As Integer,  ByVal wGainCode As Integer) As Single
Declare Function A8111_ADs_Float Lib "A8111.DLL" (
      ByVal wBase As Integer, ByVal wChannel As Integer,
      ByVal wGainCode As Integer, fBuf As Single,
      ByVal wCount As Integer) As Integer
Declare Function A8111_ADsPacer_Float Lib "A8111.DLL" (
      ByVal wBase As Integer, ByVal wChannel As Integer,
      ByVal wGainCode As Integer, fBuf As Single, ByVal wCount As Integer,
      ByVal counter1 As Integer, ByVal counter2 As integer) As Integer
Declare Function A8111_AD2F Lib "A8111.DLL" (ByVal wHex As Integer,
      ByVal wGainCode As Integer) As Single
Declare Sub A8111_DA Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wHexValue As Integer)
```

```
Declare Sub A8111_Uni5_DA Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal fValue As Single)
Declare Sub A8111_Uni10_DA Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal fValue As Single)

' Function of Driver
Declare Function A8111_DriverInit Lib "A8111.DLL" () As Integer
Declare Sub A8111_DriverClose Lib "A8111.DLL" ()
Declare Function A8111_DELAY Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wDownCount As Integer) As Integer
Declare Function A8111_Check_Address Lib "A8111.DLL" (
      ByVal wBase As Integer) As Integer

' Function of Interrupt
Declare Function A8111_Int_Install Lib "A8111.DLL" (ByVal wBase As Integer,
      ByVal wIrq As Integer, ByVal dwCount As Long) As Integer
Declare Function A8111_Int_Start Lib "A8111.DLL" (ByVal Ch As Integer,
      ByVal Gain As Integer,  ByVal c1 As Integer, ByVal c2 As Integer)
      As Integer
Declare Function A8111_Int_Remove Lib "A8111.DLL" () As Integer
Declare Function A8111_Int_GetCount Lib "A8111.DLL" (dwVal As Long)
      As Integer
Declare Function A8111_Int_GetBuffer Lib "A8111.DLL" (
      ByVal dwNum As Integer, wBuffer As Integer) As Integer
Declare Function A8111_Int_GetFloatBuffer Lib "A8111.DLL" (
      ByVal dwNum As Integer, fBuffer As Single) As Integer
```

3.4 Using Delphi

3.4.1 Delphi Demo Result :



A8111 AD/DA Demo , Ads_hex()

Base Adr[hex]:	Channel	Input Range	GainType	DA Type	DA [hex]	AD value
220	0	-2.5 ~ 2.5	0 - A8111	0: Hex	80	1.8185

Analog to Digital Display

2.5

-2.5

Fig. 4.

3.4.2 A8111.PAS

```
unit A8111;

interface

type PSingle=^Single;
type PWord=^Word;

const

 A8111_TIMER0              = $00;
 A8111_TIMER1              = $01;
 A8111_TIMER2              = $02;
 A8111_TIMER_MODE          = $03;
 A8111_AD_LO               = $04;    // Analog to Digital, Low Byte
 A8111_AD_HI               = $05;    // Analog to Digital, High Byte
 A8111_DA_CH0_LO           = $04;    // Digit to Analog, CH 0
 A8111_DA_CH0_HI           = $05;
 A8111_DA_CH1_LO           = $06;    // Digit to Analog, CH 1
 A8111_DA_CH1_HI           = $07;
 A8111_DI_LO               = $06;    // Digit Input
 A8111_DO_LO               = $0D;    // Digit Output
 A8111_CLEAR_IRQ           = $08;
 A8111_SET_GAIN            = $09;
 A8111_SET_CH              = $0A;
 A8111_SET_MODE            = $0B;
 A8111_SOFT_TRIG           = $0C;
 A8111_POLLING_MODE            = 1;
 A8111_DMA_MODE                = 2;
 A8111_INTERRUPT_MODE          = 6;
```

```
//*** define the gain mode ***/
 A8111_BI_1              = 0;
 A8111_BI_2              = 1;
 A8111_BI_4              = 2;
 A8111_BI_8              = 3;
 A8111_BI_16             = 4;
 A8111_NoError           = 0;
 A8111_DriverOpenError          = 1;
 A8111_DriverNoOpen             = 2;
 A8111_GetDriverVersionError    = 3;
 A8111_InstallIrqError          = 4;
 A8111_ClearIntCountError       = 5;
 A8111_GetIntCountError         = 6;
 A8111_GetBufferError           = 7;
 A8111_AdError1                 = 100;
 A8111_AdError2                 = -200.0;
 A8111_InstallBufError          = 10;
 A8111_AllocateMemoryError      = 11;
 A8111_TimeoutError             = $ffff;
 A8111_OtherError               = 13;

// Function of Test
function  A8111_SHORT_SUB_2(nA,nB:SmallInt):SmallInt; StdCall;
function  A8111_FLOAT_SUB_2(fA,fB:Single):Single; StdCall;
function  A8111_Get_DLL_Version:Word; StdCall;
function  A8111_GetDriverVersion(var wDriverVersion:Word):Word; StdCall;

// Function of DI/DO
function  A8111_DI(wBase:Word):Word; StdCall;
procedure A8111_DO(wBase,wHexValue:word); StdCall;
procedure A8111_OutputByte(wPortAddr:WORD;bOutputVal:Byte); StdCall;
procedure A8111_OutputWord( wPortAddr:WORD;
      wOutputVal:WORD ); StdCall;
function  A8111_InputByte(wPortAddr:WORD):WORD; StdCall;
function  A8111_InputWord(wPortAddr:WORD):WORD; StdCall;
```

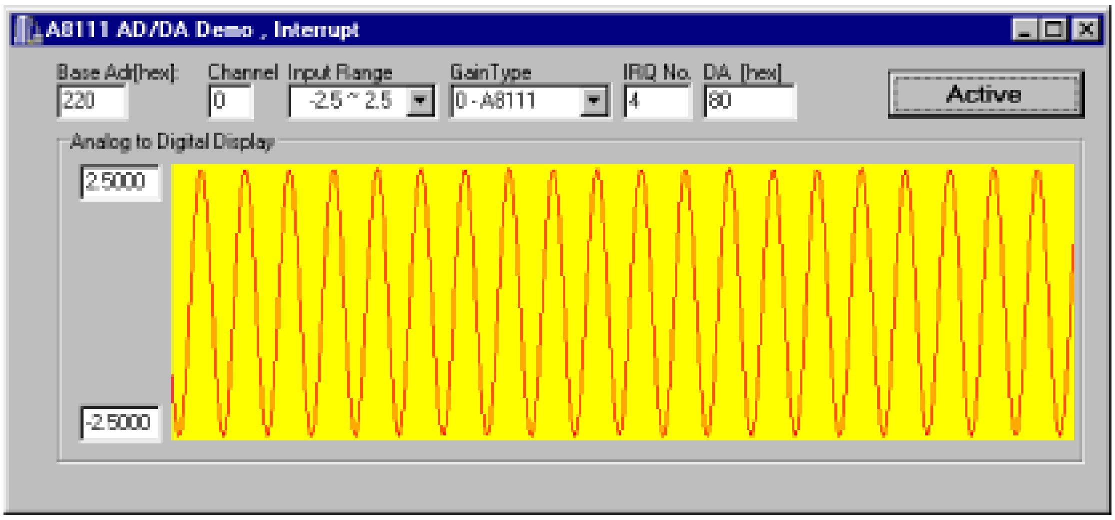
```
// Function of AD/DA
function  A8111_AD_Hex(wBase, wChannel, wGainCode:Word ):
      WORD; StdCall;
function  A8111_ADs_Hex(wBase, wChannel, wGainCode:Word; Buf:PWord;
      wCount:Word):Word; StdCall;
function  A8111_AD_Float(wBase, wChannel, wGainCode:Word):
      Single; StdCall;
function  A8111_ADs_Float( wBase, wChannel, wGainCode:Word;
      fBuf:PSingle; wCount:Word):Word; StdCall;
function  A8111_ADsPacer_Float(wBase, wChannel, wGainCode:Word;
      fBuf:PSingle; wCount:Word; counter1:WORD; counter2:WORD):
      Word; StdCall;
function  A8111_AD2F(wHex,wGainCode:Word):Single; StdCall;
procedure A8111_DA(wBase,wHexValue:Word); StdCall;
procedure A8111_Uni5_DA(wBase:Word; fValue:Single); StdCall;
procedure A8111_Uni10_DA(wBase:Word;fValue:Single); StdCall;

// Function of Driver
function  A8111_DriverInit:Word; StdCall;
procedure A8111_DriverClose; StdCall;
function  A8111_DELAY(wBase,wDownCount:Word):Word; StdCall;
function  A8111_Check_Address(wBase:Word):Word; StdCall;

// Function of Interrupt
function  A8111_Int_Install(wBase,wIrq:Word;dwCount:LongInt):
      Word; StdCall;
function  A8111_Int_Start(wChannel, wGainCode, wCounter1,
      wCounter2:Word): Word; StdCall;
function  A8111_Int_Remove:Word; StdCall;
function  A8111_Int_GetCount(var dwVal:LongInt):Word; StdCall;
function  A8111_Int_GetBuffer(dwNum:LongInt; wBuffer:PWord):
      Word; StdCall;
function  A8111_Int_GetFloatBuffer(dwNum:LongInt; fBuffer:PSingle):
      Word; StdCall;

implementation
function  A8111_SHORT_SUB_2;    external 'A8111.DLL' name
       'A8111_SHORT_SUB_2';
function  A8111_FLOAT_SUB_2;    external 'A8111.DLL' name
       'A8111_FLOAT_SUB_2';
function  A8111_Get_DLL_Version;  external 'A8111.DLL' name
      'A8111_Get_DLL_Version';
function  A8111_GetDriverVersion;  external 'A8111.DLL' name
      'A8111_GetDriverVersion';
```

```
procedure A8111_DO;               external 'A8111.DLL' name 'A8111_DO';
function  A8111_DI;               external 'A8111.DLL' name 'A8111_DI';
procedure A8111_OutputByte;       external 'A8111.DLL' name
      'A8111_OutputByte';
procedure A8111_OutputWord;       external 'A8111.DLL' name
      'A8111_OutputWord';
function  A8111_InputByte;        external 'A8111.DLL' name
      'A8111_InputByte';
function  A8111_InputWord;        external 'A8111.DLL' name
      'A8111_InputWord';

function  A8111_AD_Hex;           external 'A8111.DLL' name
      'A8111_AD_Hex';
function  A8111_ADs_Hex;          external 'A8111.DLL' name
      'A8111_ADs_Hex';
function  A8111_AD_Float;         external 'A8111.DLL' name
      'A8111_AD_Float';
function  A8111_ADs_Float;        external 'A8111.DLL' name
      'A8111_ADs_Float';
function  A8111_ADsPacer_Float;   external 'A8111.DLL' name
      'A8111_ADsPacer_Float';
function  A8111_AD2F;             external 'A8111.DLL' name
      'A8111_AD2F';
procedure A8111_DA;               external 'A8111.DLL' name 'A8111_DA';
procedure A8111_Uni5_DA;          external 'A8111.DLL' name
      'A8111_Uni5_DA';
procedure A8111_Uni10_DA;         external 'A8111.DLL' name
      'A8111_Uni10_DA';
function  A8111_DriverInit;       external 'A8111.DLL' name
      'A8111_DriverInit';
procedure A8111_DriverClose;      external 'A8111.DLL' name
      'A8111_DriverClose';
function  A8111_DELAY;            external 'A8111.DLL' name
      'A8111_DELAY';
function  A8111_Check_Address;    external 'A8111.DLL' name
      'A8111_Check_Address';
```

```
function  A8111_Int_Install;            external 'A8111.DLL' name
       'A8111_Int_Install';
function  A8111_Int_Start;              external 'A8111.DLL' name
       'A8111_Int_Start';
function  A8111_Int_Remove;             external 'A8111.DLL' name
       'A8111_Int_Remove';
function  A8111_Int_GetCount;           external 'A8111.DLL' name
       'A8111_Int_GetCount';
function  A8111_Int_GetBuffer;          external 'A8111.DLL' name
        'A8111_Int_GetBuffer';
function  A8111_Int_GetFloatBuffer; external 'A8111.DLL' name
       'A8111_Int_GetFloatBuffer';

end.
```

3.5 Using Borland C++ Builder

3.5.1 Borland C++ Builder Demo Result :



Base Adr[hex]: 220
Channel 0
Input Range -2.5 ~ 2.5
GainType 0 - A8111
IRQ No. 4
DA [hex] 80
2.5000
-2.5000

Fig. 6.

3.5.2 A8111.H

```
#ifdef __cplusplus
    #define EXPORTS extern "C" __declspec (dllimport)
#else
    #define EXPORTS
#endif

/***************** DEFINE A8111 RELATIVE ADDRESS *****************/
#define A8111_TIMER0              0x00
#define A8111_TIMER1              0x01
#define A8111_TIMER2              0x02
#define A8111_TIMER_MODE          0x03
#define A8111_AD_LO               0x04   /* Analog to Digital, Low Byte */
#define A8111_AD_HI               0x05   /* Analog to Digital, High Byte */
#define A8111_DA_CH0_LO           0x04   /* Digit to Analog, CH 0 */
#define A8111_DA_CH0_HI           0x05
#define A8111_DA_CH1_LO           0x06   /* Digit to Analog, CH 1 */
#define A8111_DA_CH1_HI           0x07
#define A8111_DI_LO               0x06   /* Digit Input */
#define A8111_DO_LO               0x0D    /* Digit Output */

#define A8111_CLEAR_IRQ           0x08
#define A8111_SET_GAIN            0x09
#define A8111_SET_CH              0x0A
#define A8111_SET_MODE            0x0B
#define A8111_SOFT_TRIG           0x0C

#define A8111_POLLING_MODE          1
#define A8111_DMA_MODE              2
#define A8111_INTERRUPT_MODE        6

/*** define the gain mode ***/
#define A8111_BI_1                  0
#define A8111_BI_2                  1
#define A8111_BI_4                  2
#define A8111_BI_8                  3
#define A8111_BI_16                 4

#define A8111_NoError               0
#define A8111_DriverOpenError       1
#define A8111_DriverNoOpen          2
#define A8111_GetDriverVersionError 3
#define A8111_InstallIrqError       4
#define A8111_ClearIntCountError    5
#define A8111_GetIntCountError      6
#define A8111_GetBufferError        7
```

```
#define A8111_AdError1                  100
#define A8111_AdError2                  -200.0
#define A8111_InstallBufError           10
#define A8111_AllocateMemoryError       11
#define A8111_TimeoutError              0xffff
#define A8111_OtherError                13

// Function of Test
EXPORTS short CALLBACK A8111_SHORT_SUB_2(short nA, short nB);
EXPORTS float CALLBACK A8111_FLOAT_SUB_2(float fA, float fB);
EXPORTS WORD  CALLBACK A8111_Get_DLL_Version(void);
EXPORTS WORD  CALLBACK A8111_GetDriverVersion(
      WORD *wDriverVersion);

// Function of DI/DO
EXPORTS WORD  CALLBACK A8111_DI(WORD wBase);
EXPORTS void  CALLBACK A8111_DO(WORD wBase, WORD wHexValue);
EXPORTS void  CALLBACK A8111_OutputByte(WORD wPortAddr,
      UCHAR bOutputVal);
EXPORTS void  CALLBACK A8111_OutputWord(WORD wPortAddr,
      WORD wOutputVal);
EXPORTS WORD  CALLBACK A8111_InputByte(WORD wPortAddr);
EXPORTS WORD  CALLBACK A8111_InputWord(WORD wPortAddr);

// Function of AD/DA
EXPORTS WORD  CALLBACK A8111_AD_Hex(WORD wBase,
      WORD wChannel, WORD wGainCode);
EXPORTS WORD  CALLBACK A8111_ADs_Hex(WORD wBase,
      WORD wChannel, WORD wGainCode ,  WORD wBuf[], WORD wCount);
EXPORTS float CALLBACK A8111_AD_Float(WORD wBase,
      WORD wChannel, WORD wGainCode);
EXPORTS WORD  CALLBACK A8111_ADs_Float(WORD wBase,
      WORD wChannel, WORD wGainCode,  float fBuf[], WORD wCount);
EXPORTS WORD  CALLBACK A8111_ADsPacer_Float(WORD wBase,
      WORD wChannel, WORD wGainCode,  float fBuf[], WORD wCount,
       WORD counter1, WORD counter2);
EXPORTS float CALLBACK A8111_AD2F(WORD wHex,WORD wGainCode );
EXPORTS void  CALLBACK A8111_DA(WORD wBase, WORD wHexValue);
EXPORTS void  CALLBACK A8111_Uni5_DA(WORD wBase, float fValue);
EXPORTS void  CALLBACK A8111_Uni10_DA(WORD wBase, float fValue);

// Function of Driver
EXPORTS WORD  CALLBACK A8111_DriverInit(void);
EXPORTS void  CALLBACK A8111_DriverClose(void);
EXPORTS WORD  CALLBACK A8111_DELAY(WORD wBase,
      WORD wDownCount);
EXPORTS WORD  CALLBACK A8111_Check_Address(WORD wBase);
```

```
// Function of Interrupt
EXPORTS WORD  CALLBACK A8111_Int_Install(WORD wBase,
      WORD wIrq, DWORD dwCount);
EXPORTS WORD  CALLBACK A8111_Int_Start(WORD wChannel,
      WORD wGainCode, WORD wCounter1, WORD wCounter2);
EXPORTS WORD  CALLBACK A8111_Int_Remove(void);
EXPORTS WORD  CALLBACK A8111_Int_GetCount(DWORD *dwVal);
EXPORTS WORD  CALLBACK A8111_Int_GetBuffer(DWORD dwNum,
       WORD wBuffer[]);
EXPORTS WORD  CALLBACK A8111_Int_GetFloatBuffer(DWORD dwNum,
      float fBuffer[]);
```

4. Software Function Guide

These function in DLL are divided into several groups as following:

- The test functions
- The driver functions
- The DI/DO functions
- The A/D , D/A conversion functions
- The IRQ-mode A/D , D/A conversion functions

The functions of test listing as follows:

1. A8111_SHORT_SUB_2
2. A8111_FLOAT_SUB_2
3. A8111_Get_DLL_Version
4. A8111_GetDriverVersion

The functions of driver listing as follows:

1. A8111_DriverInit
2. A8111_DriverClose
3. A8111_Check_Address
4. A8111_DELAY

The functions of DI/DO listing as follows:

1. A8111_DI
2. A8111_DO
3. A8111_InputByte
4. A8111_InputWord
5. A8111_OutputByte
6. A8111_OutputWord

The functions of A/D , D/A Conversion listing as follows:

1. A8111_AD_Hex
2. A8111_AD_Float
3. A8111_ADs_Hex
4. A8111_ADs_Float
5. A8111_AD2F
6. A8111_DA
7. A8111_Uni5_DA
8. A8111_Uni10_DA

The functions of IRQ-Mode , A/D , D/A Conversion listing as follows:

1. A8111_Int_Install
2. A8111_ Int_Start
3. A8111_ Int_Remove
4. A8111_Int_GetCount
5. A8111_ Int_GetBuffer
6. A8111_ Int_GetFloatBuffer

In this chapter, we use some keywords to indicate the attribute of Parameters.

Keyword	Setting parameter by user before calling this function ?	Get the data/value from this parameter after calling this function ?
[Input]	Yes	No
[Output]	No	Yes
[Input, Output]	Yes	Yes

Note: All of the parameters need to be allocated spaces by the user.

4.1 Test Functions

4.1.1 A8111_SHORT_SUB_2

- **Description:**
  Compute C = nA - nB in **short** formats, **<u>short=16 bits sign integer.</u>** This function is provided for testing purpose.

- **Syntax:**
  short A8111_SHORT_SUB_2(short nA, short nB);

- **Parameter:**

nA	: [Input] short integer
nB	: [Input] short integer

- **Return:**
  return = nA - nB → short integer

4.1.2 A8111_FLOAT_SUB_2

- **Description:**
  Compute fA - fB in **float** format, **<u>float=32 bits floating pointer number.</u>** This function is provided for testing purpose.

- **Syntax:**
  float A8111_FLOAT_SUB_2(float fA, float fB);

- **Parameter:**

fA	: [Input] floating point value
fB	: [Input] floating point value

- **Return:**
  return = fA - fB → floating point value

4.1.3 A8111_Get_DLL_Version

- **Description:**
  Read the software version of the A8111.DLL.
- **Syntax:**
  WORD A8111_Get_DLL_Version(void) ;
- **Parameter:**
  void
- **Return:**
  return=0x200 → Version 2.00 **(WORD=16 bits unsigned integer)**

4.1.4 A8111_GetDriverVersion

- **Description:**
  This subroutine will get the version number about the device driver.
- **Syntax:**
  WORD A8111_GetDriverVersion(WORD *wDriverVersion);
- **Parameter:**

wDriverVersion	: [Output] the address of wDriverVersion. When wDriverVerion=0x210 →version 2.10

- **Return:**

A8111_NoError	: Successful in opening the device driver
A8111_GetDriverVersionError	: Fail in opening the device driver.

4.2 Driver Functions

4.2.1 A8111_DriverInit

- **Description:**

  This subroutine will open the device driver and allocate the resources for the device driver. This function must be called once before calling other functions.

- **Syntax:**

  WORD A8111_DriverInit (void);

- **Parameter:**

  void

- **Return:**

A8111_NoError	: successful in opening the device driver
A8111_OpenError	: fail in opening the device driver.

4.2.2 A8111_DriverClose

- **Description:**

  This subroutine will close the device driver and release the resources.

- **Syntax:**

  void A8111_DriverClose (void);

- **Parameter:**

  void

- **Return:**

  void

4.2.3 A8111_DELAY

This function has been reserved. The user can't call this function.

4.2.4 A8111_Check_Address

- **Description:**
  This subroutine will detect the A-8111 in I/O base address = **wBase**. This subroutine will perform one A/D conversion, if success → find a A-8111.

- **Syntax:**
  WORD A8111_Check_Address(WORD wBase);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220

- **Return:**

A8111_NoError	: Find a A-8111 OK
A8111_TimeoutError	: Operation failure

4.3 DI/DO Functions

4.3.1 A8111_DI

- **Description:**
  This subroutine will read the 16 bits data from the digital input port.
- **Syntax:**
  WORD A8111_DI(WORD wBase);
- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220

- **Return:**
  16 bit data read from the digital input port

4.3.2 A8111_DO

- **Description:**
  This subroutine will send the 16 bits data to digital output port.
- **Syntax:**
  void A8111_DO(WORD wBase, WORD wHexValue);
- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wHexValue	: [Input] 16 bit data send to digital output port

- **Return:**
  void

4.3.3 A8111_OutputByte

- **Description:**
  This subroutine will send the 8 bits data to the desired I/O port.
- **Syntax:**
  void A8111_OutputByte(WORD wPortAddr, UCHAR bOutputVal);
- **Parameter:**

wPortAddr	: [Input] I/O port address, for example, 0x220
bOutputVal	: [Input] 8 bit data send to I/O port

- **Return:**
  void

4.3.4 A8111_OutputWord

- **Description:**
  This subroutine will send the 16 bits data to the desired I/O port.
- **Syntax:**
  void A8111_OutputByte(WORD wPortAddr, WORD wOutputVal);
- **Parameter:**

wPortAddr	: [Input] I/O port address, for example, 0x220
wOutputVal	: [Input] 16 bit data send to I/O port

- **Return:**
  void

4.3.5 A8111_InputByte

- **Description:**
  This subroutine will input the 8 bit data from the desired I/O port.
- **Syntax:**
  WORD A8111_InputByte(WORD wPortAddr);
- **Parameter:**
  wPortAddr : [Input] I/O port address, for example, 0x220
- **Return:**
  16 bits data with the leading 8 bits are all 0

4.3.6 A8111_InputWord

- **Description:**
  This subroutine will input the 16 bit data from the desired I/O port.
- **Syntax:**
  WORD A8111_InputWord(WORD wPortAddr);
- **Parameter:**
  wPortAddr : [Input] I/O port address, for example, 0x220
- **Return:**
  16 bits data.

4.4 A/D , D/A Functions

4.4.1 A8111_AD_Hex

- **Description:**
  This subroutine will perform a A/D conversion by polling. The A/D converter is 12 bits for A-8111. This subroutine will compute the result according to the **configuration code** (Section 1.2).

- **Syntax:**
```
WORD A8111_AD_Hex(WORD wBase, WORD wChannel,
                  WORD wGainCode);
```

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wChannel	: [Input] A/D channel number,
wGainCode	: [Input] Configuration codes, refer to Section 1.2.

- **Return:**

A8111_TimeoutError	: A/D converter error (return 0xffff)
Other value	: The **Hex value** of A/D conversion. (0x0 ~ 0x0fff)

4.4.2 A8111_AD_Float

- **Description:**
  This subroutine will perform a A/D conversion by polling. The A/D converter is 12 bits for A-8111. This subroutine will compute the result according to the **configuration code** (Section 1.2).

- **Syntax:**
```
float A8111_AD_Float(WORD wBase, WORD wChannel,
                     WORD wGainCode);
```

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wChannel	: [Input] A/D channel number,
wGainCode	: [Input] Configuration codes, refer to Section 1.2

- **Return:**

A8111_AdError2	: A/D converter error (return -200.0)
Other value	: The **floating-point value** of A/D conversion

4.4.3 A8111_ADs_Hex

- **Description:**
  This subroutine will perform a number of A/D conversions by polling. This subroutine is very similar to A8111_AD_Hex except that this subroutine will perform wCount of conversions instead of just one conversion. The A/D conversing at the ISA bus's max speed After A/D conversing, the A/D data are stored in a buffer in Hex format. The **wBuf** is the starting address of this data buffer.

- **Syntax:**
  WORD A8111_ADs_Hex(WORD wBase, WORD wChannel,
  WORD wGainCode, WORD wBuf[], WORD wCount);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wChannel	: [Input] A/D channel number
wGainCode	: [Input] Configuration codes, refer to Section 1.2
wBuf	: [Output] Starting address of the data buffer The user must allocate spaces for this buffer and send the address into the function. This function will fill the data into this buffer. The user cans analyze these data from the buffer after calling this function.
wCount	: [Input] Number of A/D conversions will be performed

- **Return:**

A8111_TimeoutError	: A/D converter error (return 0xffff)
A8111_NoError	: Operation is OK

4.4.4 A8111_ADs_Float

- **Description:**

  This subroutine will perform a number of A/D conversions by polling. This subroutine is very similar to A8111_AD except that this subroutine will perform wCount of conversions instead of just one conversion. The A/D conversing at the ISA bus’s max speed Thent he A/D data are stored in a data buffer in Float format. The **fBuf** is the starting address of this data buffer.

- **Syntax:**

  WORD A8111_ADs_Float(WORD wBase, WORD wChannel,
  WORD wGainCode, float fBuf[], WORD wCount);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wChannel	: [Input] A/D channel number
wGainCode	: [Input] Configuration codes, refer to Section 1.2
fBuf	: [Output] Starting address of the data buffer **(in float format)** The user must allocate spaces for this buffer and send the address into the function. This function will fill the data into this buffer. The user cans analyze these data from the buffer after calling this function.
wCount	: [Input] Number of A/D conversions will be performed

- **Return:**

A8111_TimeoutError	: A/D converter error (return 0xffff)
A8111_NoError	: Operation is OK

4.4.5 A8111_ADsPacer_Float

- **Description:**

  This subroutine will perform a number of A/D conversions by Pacer Trigger + Software Transfer. This subroutine is very similar to A8111_Ads_Float() except that this subroutine will trigger the AD converter by the Pacer (Uses the counter1 and counter2) .The A/D data are stored in a data buffer in Float format. The **fBuf** is the starting address of this data buffer.

- **Syntax:**

```
WORD A8111_ADsPacer_Float(WORD wBase, WORD wChannel,
                WORD wGainCode, float fBuf[], WORD wCount,
                WORD counter1, WORD counter2);
```

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wChannel	: [Input] A/D channel number
wGainCode	: [Input] Configuration codes, refer to Section 1.2
fBuf	: [Output] Starting address of the data buffer **(in float format)** The user must allocate spaces for this buffer and send the address into the function. This function will fill the data into this buffer. The user cans analyze these data from the buffer after calling this function.
wCount	: [Input] Number of A/D conversions will be performed
counter1	: [Input] The value of Counter 1
counter2	: [Input] The value of Counter 2

(The sampling rate is : 2Mhz / (counter1 * counter 2))

- **Return:**

A8111_TimeoutError	: A/D converter error (return 0xffff)
A8111_NoError	: Operation is OK

4.4.6 A8111_AD2F

- **Description:**
  This subroutine will convert the Hex value to floating value depending on GainCode , Bipolar/Unipolar and 10v/20v.

- **Syntax:**
  float ISO813_AD2F(WORD wHexValue, WORD wGainCode);

- **Parameter:**

wHexValue	: [Input] Hex Value 0 ~ 0x0FFF
wGainCode	: [Input] Refer to Sec. 1.2 for detail information

- **Return:**

A8111_AdError2	: A/D converter error (-200.0)
Other value	: The **floating-point value** of A/D conversion

4.4.7 A8111_DA

- **Description:**
  This subroutine will send the 12 bits data to D/A analog output. The output range of D/A maybe 0-5V or 0-10V **setting by hardware jumper, JP1.** The software **can not detect** the output range of D/A converter. **For examples, if hardware select -5V, the 0xfff will send out 5V. If hardware select -10V, the 0xfff will send out 10V. The factory setting select 0-5V D/A output range.**

- **Syntax:**
  void A8111_DA(WORD wBase, WORD wHexValue);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
wHexValue	: [Input] 12 bit data send to D/A converter (0x0 ~ 0x0fff)

- **Return:**
  None

4.4.8 A8111_Uni5_DA

- **Description:**
  This subroutine will send the 12 bits data to D/A analog output. The output range of D/A dependent on **setting by hardware jumper, JP1 (-5v or ± 10v), JP10/JP11(Bipolar or Unipolar).** The software **can not detect** the output range of D/A converter. This subroutine can be used only when the jumper's settings are **: Unipolar , -5v .** The **output range is between 0.0v and 5.0v.** Please refer to hardware manual to setting jumpers.

- **Syntax:**
  void A8111_Uni5_DA(WORD wBase, float fValue);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
fValue	: [Input] Floating-point send to D/A converter (0.0v ~ 5.0v)

- **Return:**
  None

4.4.9 A8111_Uni10_DA

- **Description:**
  This subroutine will send the 12 bits data to D/A analog output. The output range of D/A dependent on **setting by hardware jumper, JP1 (-5v or ± 10v), JP10/JP11(Bipolar or Unipolar).** The software **can not detect** the output range of D/A converter. This subroutine can be used only when the jumper's settings are **: Unipolar , -10v .** The **output range is between 0.0v and 10.0v.** Please refer to hardware manual to setting jumpers.

- **Syntax:**
  void A8111_Uni10_DA(WORD wBase, float fValue);

- **Parameter:**

wBase	: [Input] I/O port base address, for example, 0x220
fValue	: [Input] Floating-point send to D/A converter (0.0v ~ 10.v)

- **Return:**
  None

4.5 Interrupt Functions

4.5.1 A8111_Int_Install

- **Description:**

  This subroutine will install interrupt handler for a specific IRQ level n. For more detail information of using interrupt please refer to Section 4.5.7 "IRQ-mode conceptual diagram"

- **Syntax:**

```
WORD A8111_Int_Install(WORD wBase,  WORD wIrq,
                                  DWORD dwCount );
```

- **Parameter:**

wBase	: [Input] the I/O port base address for A-8111 card.
wIrq	: [Input] the IRQ level . (Valid numbers are: 2,3,4,5,6,7)
dwCount	: [Input] the desired A/D entries count for interrupt transfer.

- **Return:**

A8111_NoError	: successful
A8111_InstallIrqError	: fail in install IRQ handler.

4.5.2 A8111_Int_Start

- **Description:**

  This subroutine will start the interrupt transfer for a specific A/D channel and programming the gain code and sampling rate.

- **Syntax:**

```
WORD A8111_Int_Start(WORD wCh, WORD wGain, WORD c1,
                           WORD c2 )
```

- **Parameter:**

wCh	: [Input] the A/D channel.
wGain	: [Input] the Gain Code, refer to sec 1.2.
c1,c2	: [Input] the sampling rate is 2M/(c1*c2)

- **Return:**

A8111_NoError	: successful
A8111_INTStartError	: fail

4.5.3 A8111_Int_Remove

- **Description:**
  This subroutine will stop the interrupt transfer and remove the installed interrupt handler.

- **Syntax:**
  WORD A8111_Int_Remove(void)

- **Parameter:**
  void.

- **Return:**

A8111_NoError	: successful
A8111_INTStopError	: fail

4.5.4 A8111_Int_GetCount

- **Description:**
  This subroutine will read the transferred count of interrupt.

- **Syntax:**
  WORD A8111_Int_GetCount(DWORD *dwVal)

- **Parameter:**

dwVal:	[Output] the address of dwVal, the dwVal is the interrupt transferred count.

- **Return:**

A8111_NoError	: successful
A8111_GetIntCountError	: fail get interrupt count.

4.5.5 A8111_Int_GetBuffer

- **Description:**
  This subroutine will copy the transferred interrupted data into the user’s buffer.

- **Syntax:**
  WORD A8111_Int_GetBuffer(DWORD dwNum, WORD wBuffer[])

- **Parameter:**

dwNum	: [Input] the entry no to transfer.
wBuffer	: [Output] the address of wBuffer(WORD format) The user must allocate spaces for this buffer and send the address into the function. This function will fill the data into this buffer. The user cans analyze these data from the buffer after calling this function.

- **Return:**

A8111_NoError	: successful
A8111_GetBufferError	: fail

4.5.6 A8111_Int_GetFloatBuffer

- **Description:**
  This subroutine will copy the transferred interrupted data into the user’s buffer.

- **Syntax:**
  WORD A8111_Int_GetFloatBuffer(DWORD dwNum, float fBuffer[])

- **Parameter:**

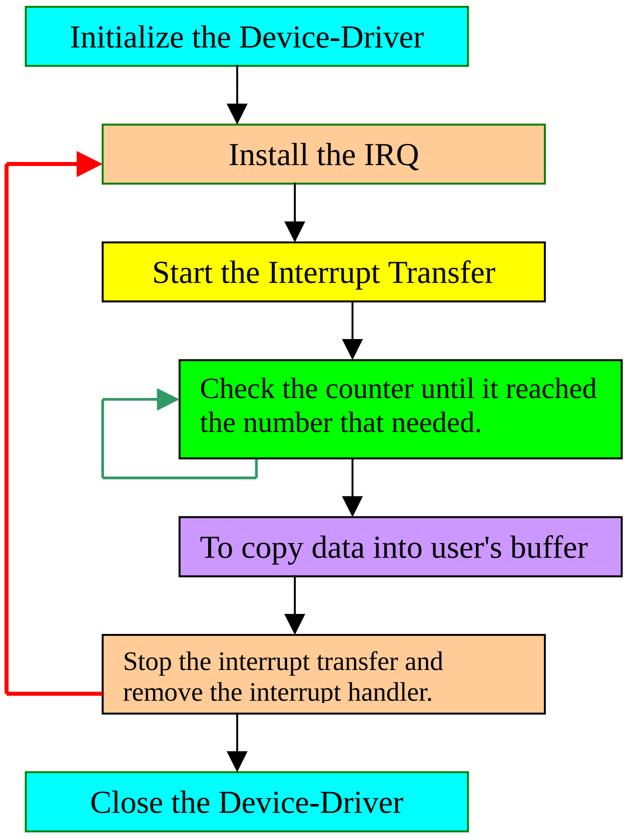
dwNum	: [Input] the entry no to transfer.
fBuffer	: [Output] the address of fBuffer(float format) The user must allocate spaces for this buffer and send the address into the function. This function will fill the data into this buffer. The user cans analyze these data from the buffer after calling this function.

- **Return:**

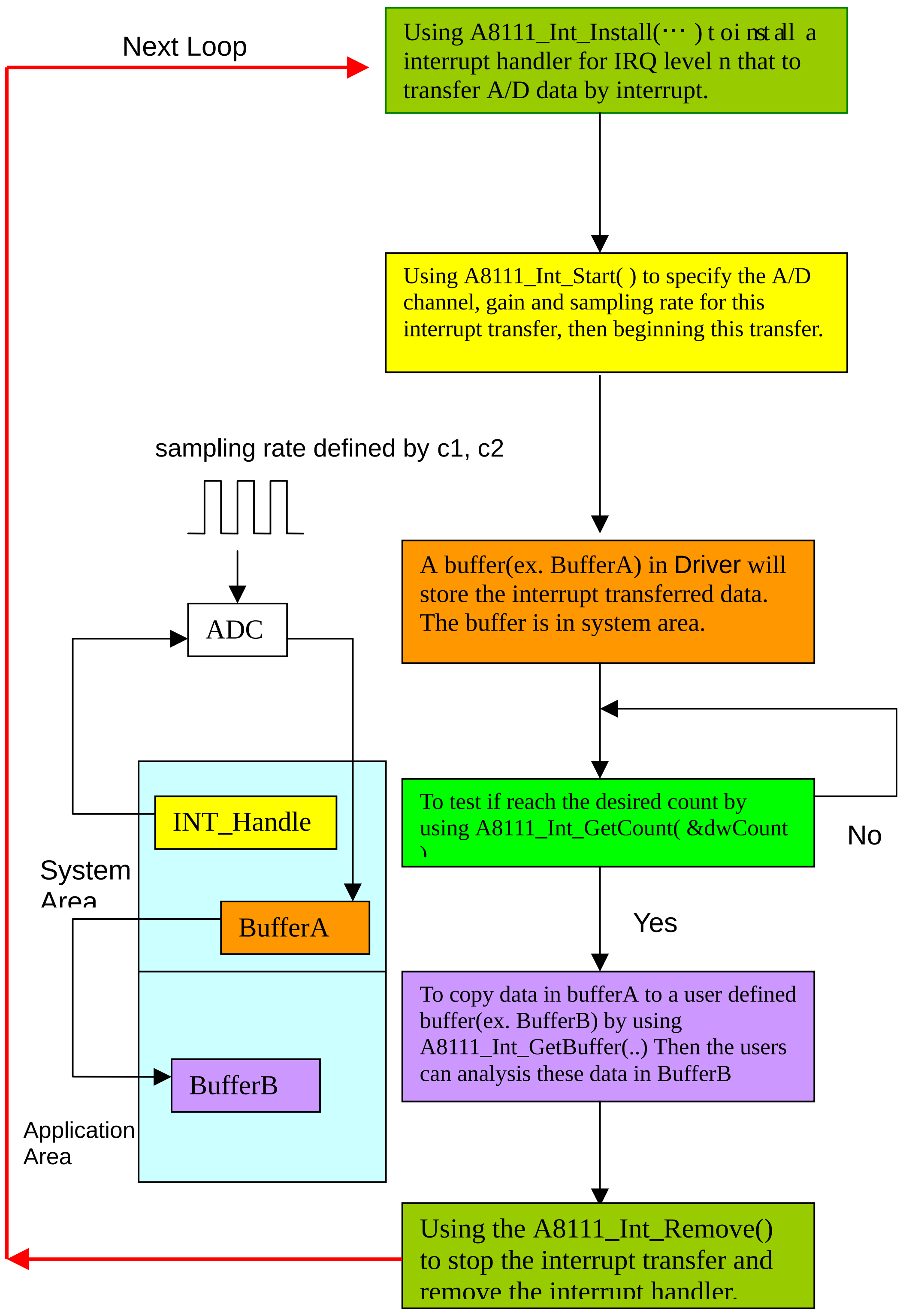
A8111_NoError	: successful
A8111_GetBufferError	: fail

4.5.7 IRQ-mode conceptual diagram

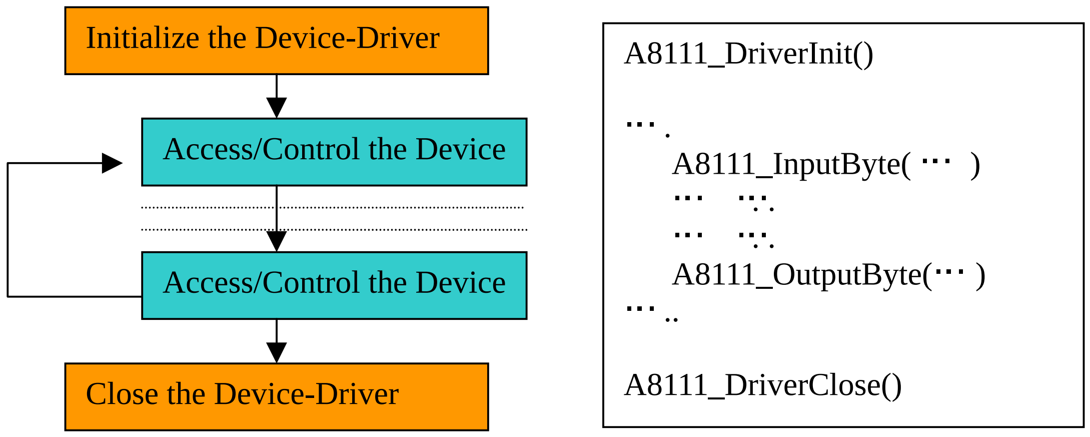
The 4.5.1 to 4.5.6 are these functions to perform the A/D conversion with interrupt transfer. The flow chart to program these functions is given as follows:

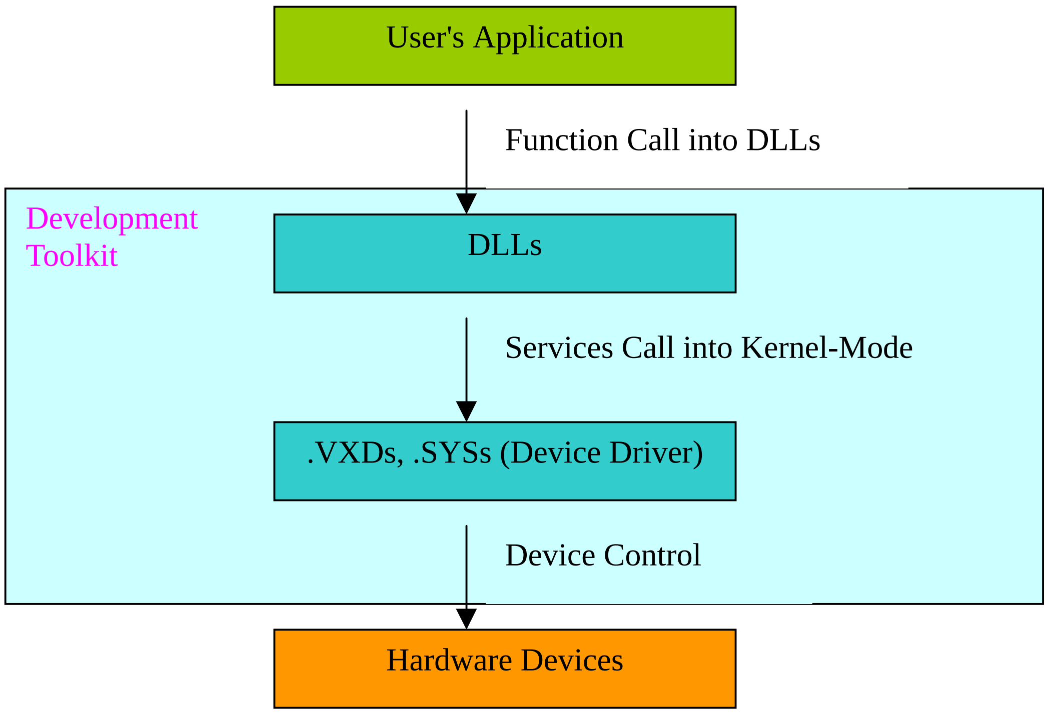

Initialize the Device-Driver
Install the IRQ
Start the Interrupt Transfer
Check the counter until it reached the number that needed.
To copy data into user's buffer
Stop the interrupt transfer and remove the interrupt handler.
Close the Device-Driver

```
A8111_DriverInit

    A8111_Int_Install( ··· )

    A8111_Int_Start( ··· )
    ···  ···
          A8111_Int_GetCount( ··· . )

          A8111_Int_GetBuffer( ··· . )
    ···  ···
    A8111_Int_Remove()
     ···  ……·
A8111_DriverClose
```


Next Loop
Using A8111_Int_Install(…) to install a interrupt handler for IRQ level n that to transfer A/D data by interrupt.
Using A8111_Int_Start( ) to specify the A/D channel, gain and sampling rate for this interrupt transfer, then beginning this transfer.
sampling rate defined by c1, c2
ADC
A buffer(ex. BufferA) in Driver will store the interrupt transferred data. The buffer is in system area.
INT_Handle
System Area
BufferA
To test if reach the desired count by using A8111_Int_GetCount(&dwCount)
No
Yes
To copy data in bufferA to a user defined buffer(ex. BufferB) by using A8111_Int_GetBuffer(..) Then the users can analysis these data in BufferB
BufferB
Application Area
Using the A8111_Int_Remove() to stop the interrupt transfer and remove the interrupt handler.

5. Program Architecture





6. Demo List

6.1 Visual C++ Demo

There is some demo programs given as following:

```
|--\Demo
      |--\VC5
            |--\01
            |      |--Demo1.c    → DI/DO,A/D,D/A,Interrupt Demo
            |--\A8111.h          → include header file for VC++
            |--\A8111.lib        → linkage library file for VC++
```

Refer to the company floppy disk for details.

6.2 Visual Basic Demo

There is some demo programs given as following:

```
|--\Demo
      |--\VB5
            |--\01               → DLL function and configuration test
            |--\02               → DI/DO function test
            |--\03               → A/D, D/A function Demo by Ads_Hex
            |--\04               → A/D, D/A function Demo by Ads_Float
            |--\05               → A/D, D/A function Demo by Interrupt Mode
            |--\A8111.BAS        → Include Module file for VB
```

Refer to the company floppy disk for details.

6.3 Delphi Demo

There is some demo programs given as following:

```
|--\Demo
     |--\Delphi3
          |--\01          → DLL function and configuration test
          |--\02          → DI/DO function test
          |--\03          → A/D, D/A function Demo by Ads_Hex
          |--\04          → A/D, D/A function Demo by Ads_Float
          |--\05          → A/D, D/A function Demo by Interrupt Mode
          |--\A8111.Pas→ include Unit file for Delphi
```

Refer to the company floppy disk for details.

6.4 Borland C++ Builder Demo

There is some demo programs given as following:

```
|--\Demo
     |--\BCB3
          |--\01          → DLL function and configuration test
          |--\02          → DI/DO function test
          |--\03          → A/D, D/A function Demo by Ads_Hex
          |--\04          → A/D, D/A function Demo by Ads_Float
          |--\05          → A/D, D/A function Demo by Interrupt Mode
          |--\A8111.H     → include header file for Borland C++ Builder
          |--\A8111.lib   → linkage library file for Borland C++ Builder
```

Refer to the company floppy disk for details.

7. Problems Report

Technical support is available at no charge as described below. The best way to report problems is send electronic mail to

Service@icpdas.com

on the Internet.

When reporting problems, please include the following information:

1) Is the problem reproducible? If so, how?

2) What kind and version of Operation Systems that you using? For example, Windows 3.1, Windows for Workgroups, Windows NT 4.0, etc.

3) What kinds of our products that you using? Please see the product's manual .

4) If a dialog box with an error message was displayed, please include the full text of the dialog box, including the text in the title bar.

5) If the problem involves other programs or hardware devices, what devices or version of the failing programs that you using?

6) Other comments relative to this problem or any Suggestions will be welcomed.

After we received your comments, we will take about two business days to testing the problems that you said. And then reply as soon as possible to you. Please check that we have received your comments? And please keeping contact with us.

E-mail: Service@icpdas.com
Web-Site: http://www.icpdas.com