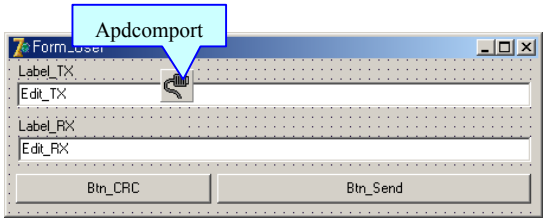
## ■ MODBUS RTU 사용을 위한 샘플 프로그램 ( Sample Program for MODBUS RTU Protocol )

**사용 프로그램(Programming Tool): 델파이(Delphi) Version 3.0 ~ 7.0**

**이 프로그램은 OTIS-LG Servo Drive ( FDA6000 series ) 에서 쓰이는 MODBUS RTU Protocol을 사용자가 쉽게 이해하기 위해 제작 되었습니다. 아래의 소스 코드(Source Code)를 작성하여 실행하여 주십시오.**

> **※주의** : 프로그램에서 사용되고 있는 콤포넌트(Component) ' APDCOMPORT' 는 Async Professional (제작사: Turbopower) 을 인스톨 하시면 사용하실 수 있습니다. Async Professional은 Turbopower사가 Source Code를 공개한 프로그램이며 SourceForge.net (http://sourceforge.net/) 에서 무상으로 다운로드 받으실 수 있습니다. 사용권한에 관한 정보는 Turbopower사의 홈페이지 (http://www.turbopower.com/) 를 참조해 주십시오.

### ① Form 구성




### ② Source Code 작성

```
unit Modbus_User;

interface
uses
  Windows, Messages, SysUtils, Variants, Classes, Graphics,
Controls, Forms,
  Dialogs, StdCtrls, ExtCtrls, OoMisc, AdPort;

type
  TForm_User = class(TForm)
    ApdComPort1: TApdComPort;
    Timer1: TTimer;
    Edit_TX: TEdit;
    Btn_CRC: TButton;
    Btn_Send: TButton;
    Label_TX: TLabel;
    Label_RX: TLabel;
    Edit_RX: TEdit;

    procedure FormShow(Sender: TObject);
    function Make_CRCvalue(Data: array of byte;
nByte:word):Word;
    procedure Btn_SendClick(Sender: TObject);
    procedure Btn_CRCClick(Sender: TObject);
    procedure ApdComPort1TriggerAvail(CP: TObject;
Count: Word);
  private
    { Private declarations }
  public
{ Public declarations }
  end;

var
  Form_User: TForm_User;

Const
//CRC 값 계산을 위한 Table.
  CRC_Table:  ARRAY[0..255] OF WORD =
```

($0000,$C0C1,$C181,$0140,$C301,$03C0,$0280,$C241,$C601,$06C0,$0780,$C741,$0500,$C5C1,$C481,$0440,$CC01,$0CC0,$0D80,$CD41,$0F00,$CFC1,$CE81,$0E40,$0A00,$CAC1,$CB81,$0B40,$C901,$09C0,$0880,$C841,$D801,$18C0,$1980,$D941,$1B00,$DBC1,$DA81,$1A40,$1E00,$DEC1,$DF81,$1F40,$DD01,$1DC0,$1C80,$DC41,$1400,$D4C1,$D581,$1540,$D701,$17C0,$1680,$D641,$D201,$12C0,$1380,$D341,$1100,$D1C1,$D081,$1040,$F001,$30C0,$3180,$F141,$3300,$F3C1,$F281,$3240,$3600,$F6C1,$F781,$3740,$F501,$35C0,$3480,$F441,$3C00,$FCC1,$FD81,$3D40,$FF01,$3FC0,$3E80,$FE41,$FA01,$3AC0,$3B80,$FB41,$3900,$F9C1,$F881,$3840,$2800,$E8C1,$E981,$2940,$EB01,$2BC0,$2A80,$EA41,$EE01,$2EC0,$2F80,$EF41,$2D00,$EDC1,$EC81,$2C40,$E401,$24C0,$2580,$E541,$2700,$E7C1,$E681,$2640,$2200,$E2C1,$E381,$2340,$E101,$21C0,$2080,$E041,$A001,$60C0,$6180,$A141,$6300,$A3C1,$A281,$6240,$6600,$A6C1,$A781,$6740,$A501,$65C0,$6480,$A441,$6C00,$ACC1,$AD81,$6D40,$AF01,$6FC0,$6E80,$AE41,$AA01,$6AC0,$6B80,$AB41,$6900,$A9C1,$A881,$6840,$7800,$B8C1,$B981,$7940,$BB01,$7BC0,$7A80,$BA41,$BE01,$7EC0,$7F80,$BF41,$7D00,$BDC1,$BC81,$7C40,$B401,$74C0,$7580,$B541,$7700,$B7C1,$B681,$7640,$7200,$B2C1,$B381,$7340,$B101,$71C0,$7080,$B041,$5000,$90C1,$9181,$5140,$9301,$53C0,$5280,$9241,$9601,$56C0,$5780,$9741,$5500,$95C1,$9481,$5440,$9C01,$5CC0,$5D80,$9D41,$5F00,$9FC1,$9E81,$5E40,$5A00,$9AC1,$9B81,$5B40,$9901,$59C0,$5880,$9841,$8801,$48C0,$4980,$8941,$4B00,$8BC1,$8A81,$4A40,$4E00,$8EC1,$8F81,$4F40,$8D01,$4DC0,$4C80,$8C41,$4400,$84C1,$8581,$4540,$8701,$47C0,$4680,$8641,$8201,$42C0,$4380,$8341,$4100,$81C1,$8081,$4040);

implementation

{$R *.dfm}

**//각 콤포넌트들의 설명 구성 및 APDComport의 초기 설정.**

procedure TForm_User.FormShow(Sender: TObject);
begin
  Form_User.Caption:='OTIS-LG 서보 드라이브 Modbus 테스트용 샘플 프로그램';
  Label_TX.Font.Color:=clyellow;
  Label_TX.Caption:='송신 데이타';
  Edit_TX.Color:=clyellow;
  Edit_TX.Font.Color:=clblack;
  Edit_TX.Text:='송신 데이타(16진수 형식)';
  Label_RX.Font.Color:=clblue;
  Label_RX.Caption:='수신 데이타';
  Edit_RX.Color:=clblue;
  Edit_RX.Font.Color:=clwhite;
  Edit_RX.text:='수신 데이타(16진수 형식)';
  Btn_CRC.Caption:='CRC값 작성';
  Btn_Send.Caption:='데이타 전송';

  Apdcomport1.ComNumber:=1;//사용하는 컴퓨터의 시리얼 포트 번호
  Apdcomport1.Baud:=9600;//통신 속도
end;

**//Table에 의한 CRC값 생성 함수**

function TForm_User.Make_CRCvalue(Data: array of byte; nByte: word): Word;
var
  CRCValue:Word;
  i:integer;
begin
  CRCvalue:=$FFFF;
  For i := 1 to nByte do
    CRCvalue := Hi(CRCvalue)  XOR CRC_Table[ Data[i-1] XOR Lo(CRCvalue) ];
  Result:=CRCvalue;

```
end;

//송신할 DATA에 CRC값을 계산하여 첨가.
procedure TForm_User.Btn_CRCClick(Sender: TObject);
var
  i,j:integer;
  CRC_Data_Len:integer;//CRC 계산에 사용될 데이타 길이
  CRC_Data_Array:array[1..30]of  byte;//CRC 계산에 사용될 데이타
  Result_CRC:Word;//계산된 CRC값
begin
  CRC_Data_Len:=round(length(Edit_TX.Text)/2);
  For i:=1 to CRC_Data_Len do
    begin
      j:=i*2-1;
      CRC_Data_Array[i]:=byte(strtoint('$'+Edit_TX.Text[j]+Edit_TX.Text[j+1]));
    end;
  Result_CRC:=Make_CRCValue(CRC_Data_Array,CRC_Data_Len);
  Edit_TX.Text:=Edit_TX.Text+inttohex(Lo(Result_CRC),2)+inttohex(Hi(Result_CRC),2);
end;

//데이타 송신
procedure TForm_User.Btn_SendClick(Sender: TObject);
var
  i,j:integer;
  TX_Data_Size:integer;//송신할 데이타 길이
  TX_Data_Array:array[1..32]of byte;//송신할 데이타
begin
  Edit_RX.Text:='';
  TX_Data_Size:=round(length(Edit_TX.Text)/2);
  For i:=1 to TX_Data_Size do
    begin
      j:=i*2-1;
      TX_Data_Array[i]:=byte(strtoint('$'+Edit_TX.Text[j]+Edit_TX.Text[j+1]));
    end;
  Apdcomport1.PutBlock(TX_Data_Array,TX_Data_Size);
end;

//데이타 수신
procedure TForm_User.ApdComPort1TriggerAvail(CP:TObject; Count: Word);
var
  i:integer;
  RX_Char:char;//수신된 값
  RX_Array:array[1..200]of string;//수신된 데이타
begin
  for i:=1 to count do
    begin
      RX_Char:=Apdcomport1.GetChar;
      RX_Array[i]:=inttohex(byte(RX_Char),2);
      Edit_RX.Text:=Edit_RX.Text+RX_Array[i];
    end;
end;


end.
```

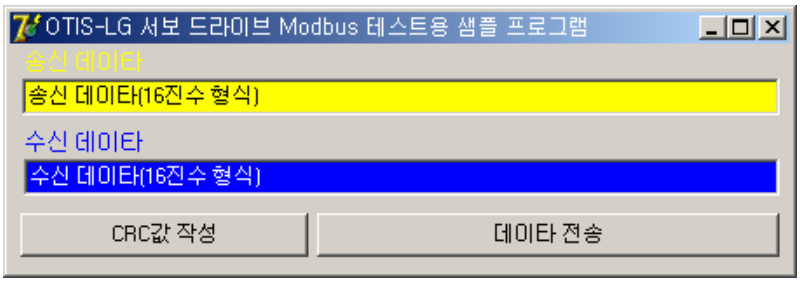
### ③ 사용예제.

다음은 **OTIS-LG Servo Drive ( FDA6000 series,** ID = 1**인 경우) 의 '제어기 형식'**(Controller Type, P2-01, addr: 0x00C8)**의 설정치를 읽기**(Function Code = 0x03) **할 경우의 예제 입니다.**

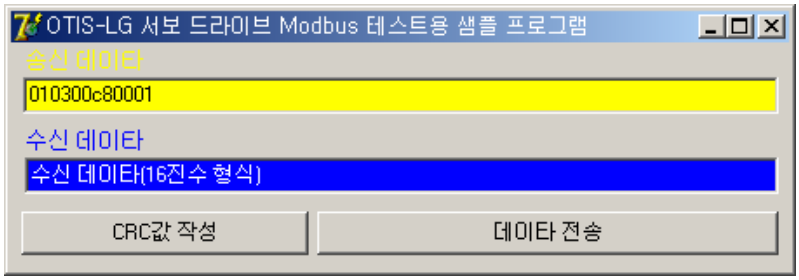
1. **송신할** DATA**를 정해진** Frame**에 맞게 구성합니다.**

| Address | Function | Start Address | | No. of Resister | | CRC | |
|---|---|---|---|---|---|---|---|
| 01 | 03 | 00 | C8 | 00 | 01 | | |

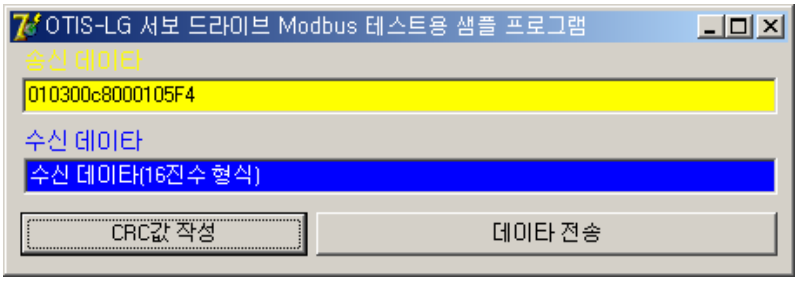
2. **프로그램을 실행 합니다.**




3. **송신 할 데이터를 입력 합니다.**




4. **'**CRC**값 작성' 버튼을 클릭하여 송신 데이터에** CRC**값을 첨가 합니다.**




5. **'데이터 전송' 버튼을 클릭하여 수신된 데이터를 확인 합니다.**

