Allen-Bradley SLC500 Serial Device Driver Guide (ABSLC5) for devices capable of using the DF1 Protocol

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1. Allen-Bradley SLC500 Device Serial Communications

1.1. Summary

The WebAccess SCADA Node provides an interface to the Allen-Bradley SLC500 series of Programmable PLCs using the DF1 protocol. This manual describes using a Serial RS232 or RS422 connection from the SCADA node to a DF1 compatible device.

For other methods of connecting to Allen Bradley PLCs, please refer to the appropriate Device Driver Guide. There are other WebAccess Guides for RSLINX and to the PLC5 series.

The WebAccess ABSLC5 Device Driver uses the DF1 protocol (Full Duplex Mode) to communicate to Allen-Bradley SLC500 series processors.

1.2. Wiring and Cabling

Typically, there are two methods to connect a SCADA Node to the SLC500:

1. A SCADA Node with an RS-232C connection directly to a DF1 compatible RS-232 port on the SLC500 processor. Most SLC 5/03 and SLC 5/04 processors support the DF1 communications using RS232C on channel 0. (Not all processors have this port). Other channels may also support DF1, but most do not.

2. A SCADA Node with an RS-232C connection directly to a DF1 compatible RS-232 Interface Module to convert DF1 to/from Data Highway, Data Highway Plus or DH-485.

Please refer to the Manufacturer's Documentation for a description of Interface Module capabilities.

Please refer to the Manufacturer's Documentation for a description of wiring and cabling..

1.2.1. RS-232 Interface Module supporting DF1

Allen Bradley Interface modules supporting DF1 via RS232 or RS422 include:

- Allen-Bradley 1770-KF2 (DF1 RS232/422 to DH or DH+),
- Allen-Bradley 1785-KE (DF1 RS232 to DH+).
- Allen-Bradley 1770-KF3 (DF1 RS232 to DH-485)

Please refer to the Manufacturer's Documentation for a description of Interface capabilities..

1.3. PLC Settings

1.3.1. Channel 0 configured for DF1

Most PLC5 processors support the DF1 communications using RS232C on channel 0. Other channels may also support DF1, but most do not.

- Channel 0
- RS232/422
- Full-Full Duplex DF1 Point-to-Point
- 8 Data Bits
- 1 Stop Bit
- Parity = None
- Error Checking = CRC (Cyclic Redundancy Check)
- Handshaking or Modem Flow Disabled
- Typical is 19200 baud. 9600 to 19200 (or faster) recommended.
- Port configured as a DF1 Slave (required to communicate with WebAccess SCADA node)

Please refer to the Manufacturer's Documentation for a description of PLC settings.

2. WebAccess: Parameters

WebAccess drivers provide object-oriented "parameters" to guide novice users with pre-built templates containing typical addresses and provide a productivity tool for experienced users. Users can select a parameter type to start, and then modify the address to the correct register in order to build a tag.

A list of some of the more commonly used parameters for the AB PLC5 are listed below. Please refer to the appendix for a larger list of parameters used in the ABPLC5 device driver.

Parameter	Data Type	Description	Address format	Conv. Code	Length	Read / Write
AI	Analog	Analog Input	I:000	Integer	16	Read Write1
AO	Analog	Analog Output	O:000	Integer	16	Read Write1
B	Analog	Binary	B3:0	Integer	16	Read Write1
BT_ELEM	Analog	Blk Word Num	BT10:0.ELEM	Integer	16	Read Write1
C_ACC	Analog	Counter Accumulated Value	C5:0.ACC	Integer	16	Read Only1
D	Analog	BCD	D10:0	BCD	16	Read Write1
F	Analog	Floating Point	F8:0	Floating Point	32	Read Write1
MG_ERR	Analog	Message Error Code	MG10:0.ERR	Integer	16	Read Write1
N	Analog	Integer	N7:0	Integer	16	Read Write1
PD_OUT	Analog	PID Output %	PD10:0.OUT	Floating Point	32	Read Write1
PD_PV	Analog	PID Process Variable	PD10:0.PV	Floating Point	32	Read Write1

PD_SP	Analog	PID Set Point	PD10:0.SP	Floating Point	32	Read Write1
S	Analog	Status	S:0	Unsigned Integer	16	Read Write1
T_ACC	Analog	Accumulated Value	T4:0.ACC	Integer	16	Read Write1
DI	Discrete	DI	I:000/00	Unsigned Integer	1	Read Only1
DO	Discrete	DO	O:000/00	Unsigned Integer	1	Read Write1
PD_SWM	Discrete	PID Software A/M Mode	PD10:0.SWM	Unsigned Integer	1	Read Write1
ST	Text	ASCII String	ST10:0	ASCII String	User defined	Read Write1

Note 1 – WebAccess cannot write reliably to a Register if Ladder Logic is also writing to the same register. Ladder Logic executes more quickly that WebAccess and will overwrite any write from WebAccess.

Note 2 – The PLC must be in RUN mode for physical IO to be scanned by the PLC and written to memory of PLC.

3. Configure an Allen-Bradley SLC500 device

3.1. Summary

1. Start the Internet Explorer **Web Browser**.
2. Enter IP address of the **Project Node**.
3. Select **WebAccess Configuration**.
4. Open or Create a **Projec**t.
5. Select a SCADA Node or use **ADD SCADA node** to create one. (A SCADA node is the PC that will connect to the PLC5 or Interface Module).

6. Configure a serial comport using **ADD Comport** for the SCADA Node.
7. Select **Serial** type Comport**.**
8. Configure Baud Rate, Data Bit, Stop Bits and Parity to match those in the PLC. All PLCs on this Comport must use the same settings.

   Typical settings are: Data Length = 8 bits Stop Bit = 1 Parity = None Transfer Rate = 19200 HandShakeRts = No

   HandShakeDtr = No
9. Press Submit.
10. Select the Comport from the list at left.
11. Select **Add Device.**
12. Select **ABSLC5** as the **Device Type**. This determines the communications Protocol and Device Driver.
13. Match the Checksum used (CRC or BCC). CRC is typical.
14. Enter the AB PLC5 Node address as the **Unit Number**.

    Node addresses on the DH and DH+ are in octal notation. Unit addresses in WebAccess are in decimal notation.
15. Use **Add Tag** to create tags.
16. Select a **parameter** to match the type of data to be read (AI, AO, DI, D O, ST, etc.). The data type of the parameter must match the data type being read (e.g. Analog, Digital/Discrete or Text/ASCII/String).
17. Modify the **Address** to match the actual address.
18. Apply a **Tag name**.
19. Optionally, assign Scaling, Engineering Units, Description and other features.

3.2. Serial Comport Properties

The Serial Comport is associated with an RS232C or RS422A port on the SCADA Node PC (usually an RS232C port). This number must match the actual COM1, COM2, etc on the SCADA node.

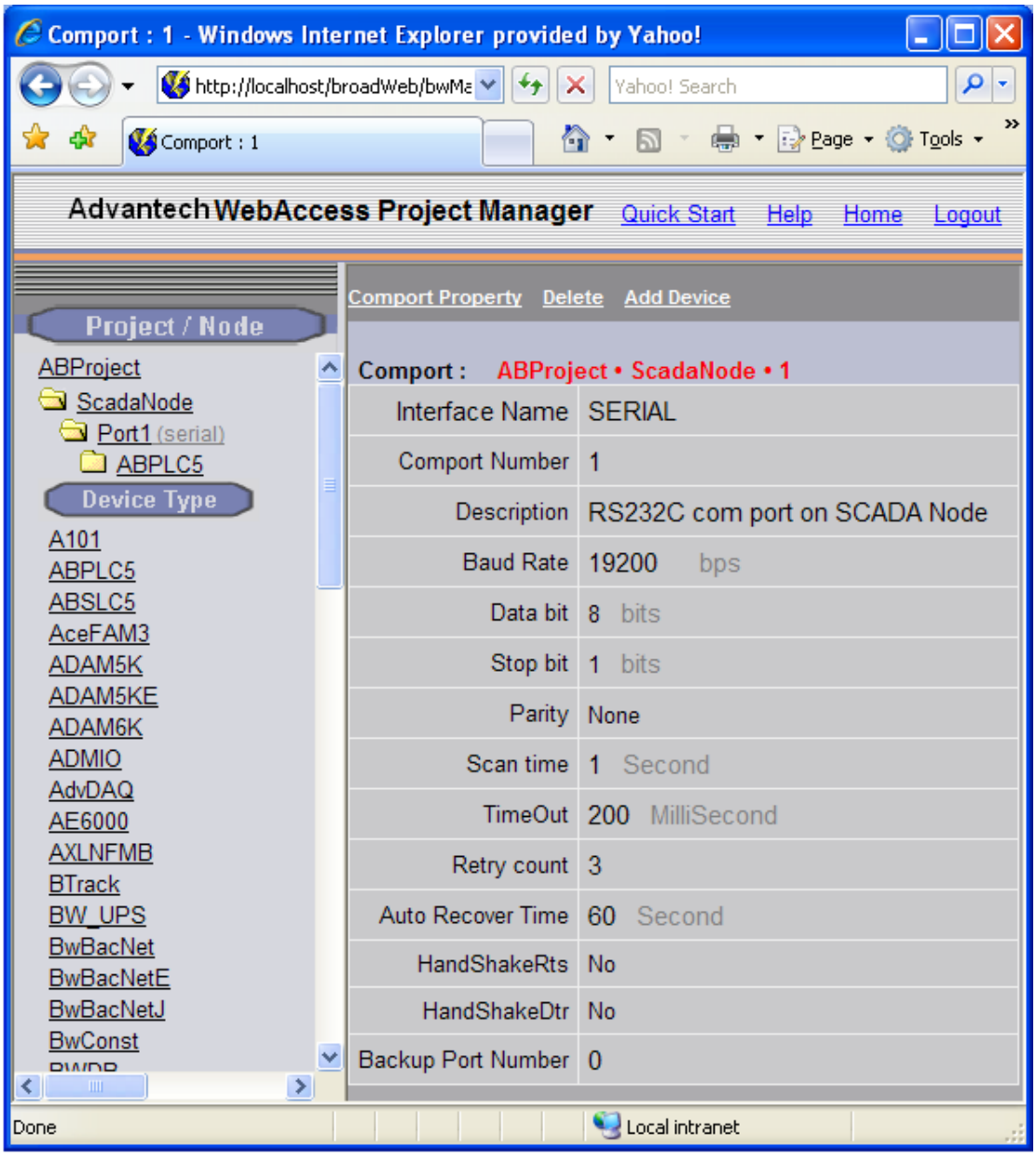


Figure 3.1 Serial Comport properties for Allen-Bradley PLC5, typical settings

3.2.1. Comport Number

The Serial Comport requires the comport number to match that of the physical interface (e.g. COM1, COM2, COM3, etc) on the SCADA Node.

3.2.2. Description

This is an optional field used for user reference.

3.2.3. Baud Rate

For the Allen-Bradley PLC5, values are from 300 to 38400 baud. Typical setting is 19200. Use the highest baud rate the SCADA Node PC, cabling and PLC5 or Interface Module can support to obtain the performance.

This must match the baud rate configured in the PLC. *Please refer to the Manufacturer's Documentation to determine the actual baud rate set in the PLC.*

All PLCs connected to this comport must use the same Baud Rate.

3.2.4. Data Bits

For the Allen-Bradley PLC5, the values are 7 or 8 Data Bits. The typical setting for an AB PLC5 is **8 bits.**

This must match the number of data bits configured in the PLC. *Please refer to the Manufacturer's Documentation to determine the actual number of Data Bits set in the PLC.*

All PLCs connected to this comport must use the same number of data bits. A typical value is 8 bits.

3.2.5. Stop Bits

For the Allen-Bradley PLC5 there can be 1 or 2 Stop Bits. The typical setting for an AB PLC5 is **1 Stop bit.**

This must match the number of stop bits configured in the PLC. *Please refer to the Manufacturer's Documentation to determine the actual number of Stop Bits set in the PLC.*

All PLCs connected to this comport must use the same number of stop bits.

3.2.6. Parity

For the Allen-Bradley PLC5 the Parity can be None, Odd, Even or Disabled.

The typical setting for an AB PLC5 is **Parity = None.**

This must match the parity configured in the PLC. *Please refer to the Manufacturer's Documentation to determine the actual number of Data Bits set in the PLC.*

All PLCs connected to this comport must use the parity.

3.2.7. Scan Time

This is the time in milliseconds to scan the PLC. This must match the ability of the PLC to respond. **A typical scan rate is 1 per second**.

If the PLC cannot respond as fast as the SCAN Time entered, WebAccess will scan at a slower rate.

3.2.8. Timeout

With a 1 second scan rate, **a typical Time Out = 200 Milliseconds**.

Timeout is the time waited before re-sending a communications packet that did not have a reply.

Timeout specifies how long the software waits for a response to a data request, specifically to wait for a reply from one packet. A recommended value is one-fifth the scan rate, longer if the communication device is slow.

Combined with Retry count, Timeout also determines time to consider a device or port as BAD. Timeout is the time to wait since last communication packet sent without a reply. Time is in milliseconds. Slow or poor quality communications require longer timeout. The faster the communications, the shorter the timeout required. Shorter timeouts result in faster reconnects after communication failures.

3.2.9. Retry Count

A typical Retry count = 3.

Number of times to retry communications if no reply is received from a device. Combined with Timeout, also determines time to consider a device or port as BAD.

This is the number of times after the first attempt has failed that communication should be attempted before indicating a failure. (If Retry count is 3, a total of 4 failed requests have occurred before tags are marked bad). Specifically, this is how many times to send a single packet after the field device fails to respond to the first packet. After the retry count is exceeded, all the tags in the packet are marked with asterisks and the next packet of requests is sent. A reasonable value is 3 to 5 times. After this number of tries, the tags in this packet are marked as "fail to respond" (i.e. asterisks) and are disabled. In reality, increasing the number of retries hides failures on the part of the field device to respond to a request. Essentially, increasing the retries gives the field device more chances to reply.

3.2.10. Auto Recover Time

A typical Auto Recover Time = 60 Seconds.

Auto Recover Time is the time to wait before attempting to re-establish communications with a BAD device or port.

If communications to the PLC is unusually slow due to hardware, communications or network issues, you might consider increasing this value. If communications to the PLC or RTU fails frequently, you may want to decrease this number in order to have WebAccess try to re-establish communications sooner.

If communications to the PLC, RTU or device Fails (i.e. exceeds Timeout) WebAccess will wait the Auto Recover Time before trying to re-establish communications.

3.2.11. Hand Shake RTS

A typical setting for Allen-Bradley PLC5 is **HandShakeRts = No**.

The RTS (Request To Send) signal is raised and lowered on the Serial Communications Port if this value set to Yes. RTS is determined by settings in the field device. *Refer to your device interface manual to determine the value for this field and the type of cable used.*

3.2.12. Hand Shake DTR

A typical setting for Allen-Bradley PLC5 is **HandShakeDtr = No**.

The DTR (Data Terminal Ready) signal raised and lowered on the Serial Communications Port if this value is set to Yes. DTR is determined by settings in the field device and the type of cable used. *Please refer to the Manufacturer's Documentation to determine if DTR handshake is set in the PLC.*

3.2.13. Backup Port

The Backup Port has not been tested for the Allen-Bradley PLC5.

3.3. Device Properties - Allen-Bradley PLC5 Serial

Add your device to the Serial Port, by selecting the Serial Port you have configured, then select **Add Device**. Or, to modify an existing Device, Select Device Properties. The **Device Properties** Page for a Serial Type Device appears.

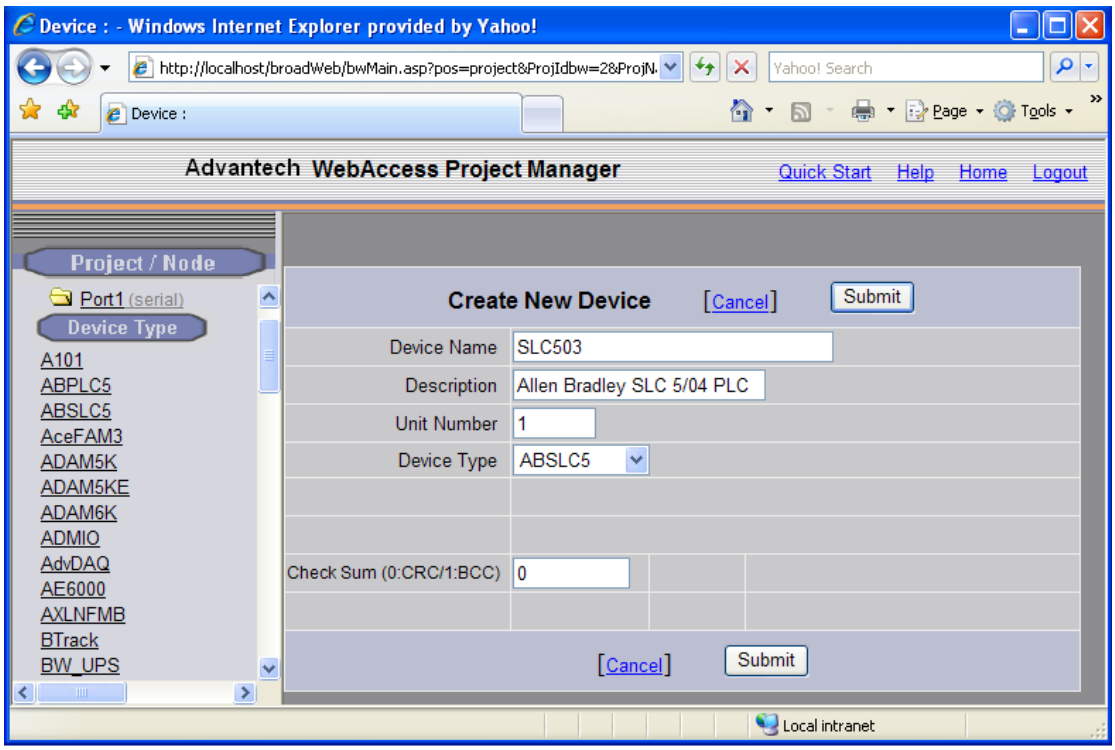


Figure 3-12 Allen-Bradley SLC500 Device

3.3.1. Device Name

A Device is a PLC, Controller, VAV or other automation hardware or software entity. **Device name** is a User-assigned name that will appear in the Project Manager (Configuration Tool) and in runtime VIEW Displays. Choosing a descriptive Name can help technicians identify the location of your device.

Changing only the Device Name will rename the existing device.

Changing both the **Device Name** and the **Unit Number** will make a copy of the device (e.g. create another device).

3.3.2. Description

User assigned description up to 32 characters

3.3.3. Unit Number

Unit Number corresponds to the **Node Address** for Allen-Bradley PLC, and must match the Number used in the protocol addressing.

Node addresses on the **DH** and **DH+** are in **octal notation**. The DH network supports addresses between 000 and 376 (octal). The DH+ network supports addresses

between 00 and 77 (octal).

Unit Numbers configured in **WebAccess** are in **decimal notation**.

For example, the **PLC5 Addresses** 000 to 077 (octal) correspond to WebAccess Unit Numbers: 0 to 63 (decimal). *Refer to the Allen-Bradley User's Manual to determine the actual address of the PLC5.*

3.3.4. Device Type

The **Device Type** is **ABPLC5**.

3.3.5. Error Checking

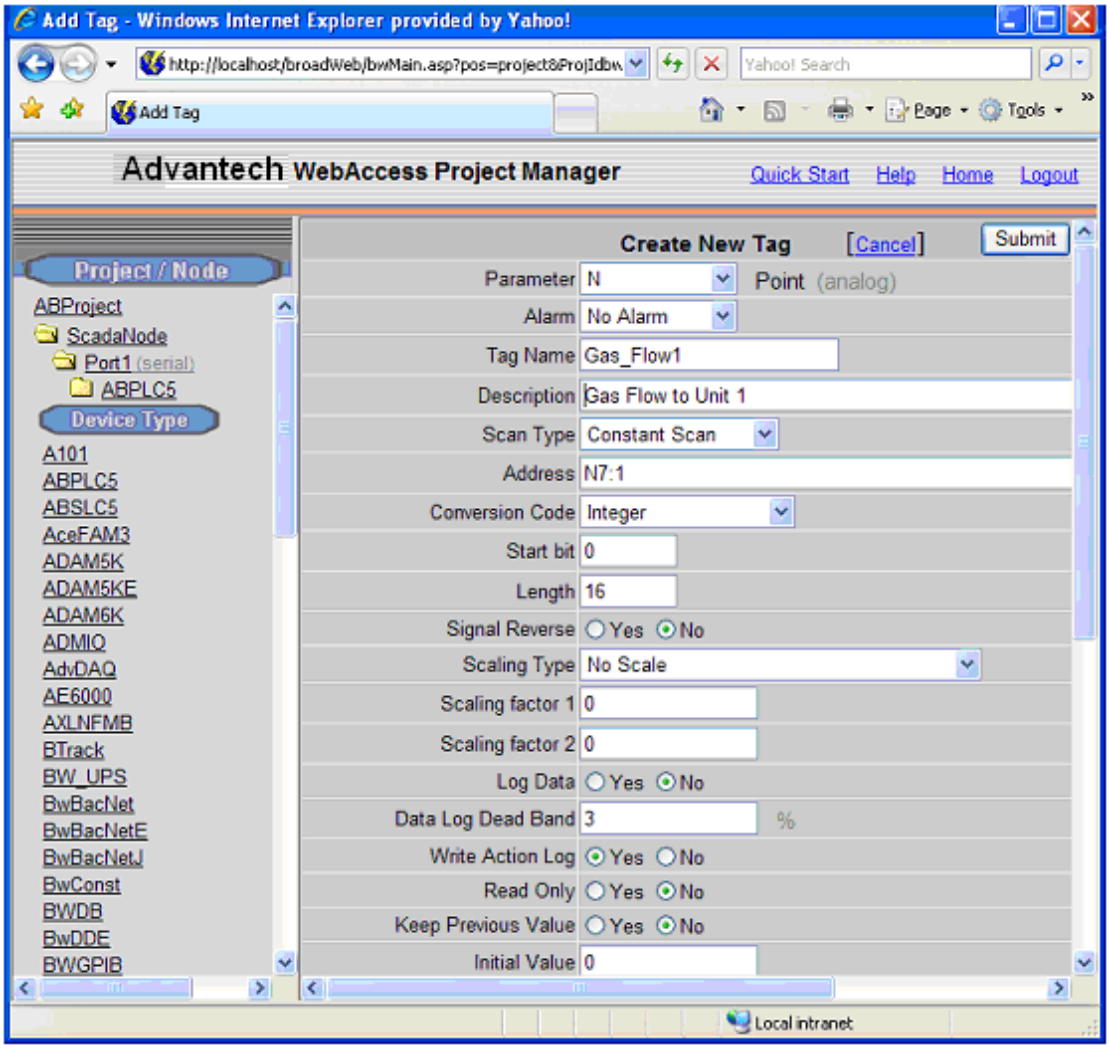
The typical setting for an AB PLC5 is Error Checking = 0 = CRC (Cyclic Redundancy Check). The alternative is BCC (Block Check Character).

4. Configure Tags

4.1. Analog Tag

This example is to configure a Tag that reads an Analog Input from the N7 range of registers (Address N7:1).

1. Open **Internet Explorer**.
2. Connect to **Project Node**.
3. Start **WebAccess Configuration**.
4. Select your **Project**.
5. Select **SCADA Node**.
6. Select the Allen-Bradley SLC500 **Device**.
7. Select **Add Tag**.



8. From **Parameter** Pull Down List select the **N** parameter. This will configure an Analog Input. Wait for the Page to update.

9. Optionally, select **ALARM** from the ALARM pulldown list. Wait for the Page to update with a PINK highlight around alarm (an additional Alarm Fields at bottom of page).

10. Enter a **Tagname** users can use to identify this Analog Input measurement. For example, if this is a Gas Flow measurement, enter **Gas_Flow1**.

11. Edit the **Address** to the actual address. From the example, Enter: **N7:1**

12. Enter a Description. This will help identify this tag to Users and Operators. For example, enter Gas Flow to Unit 1.

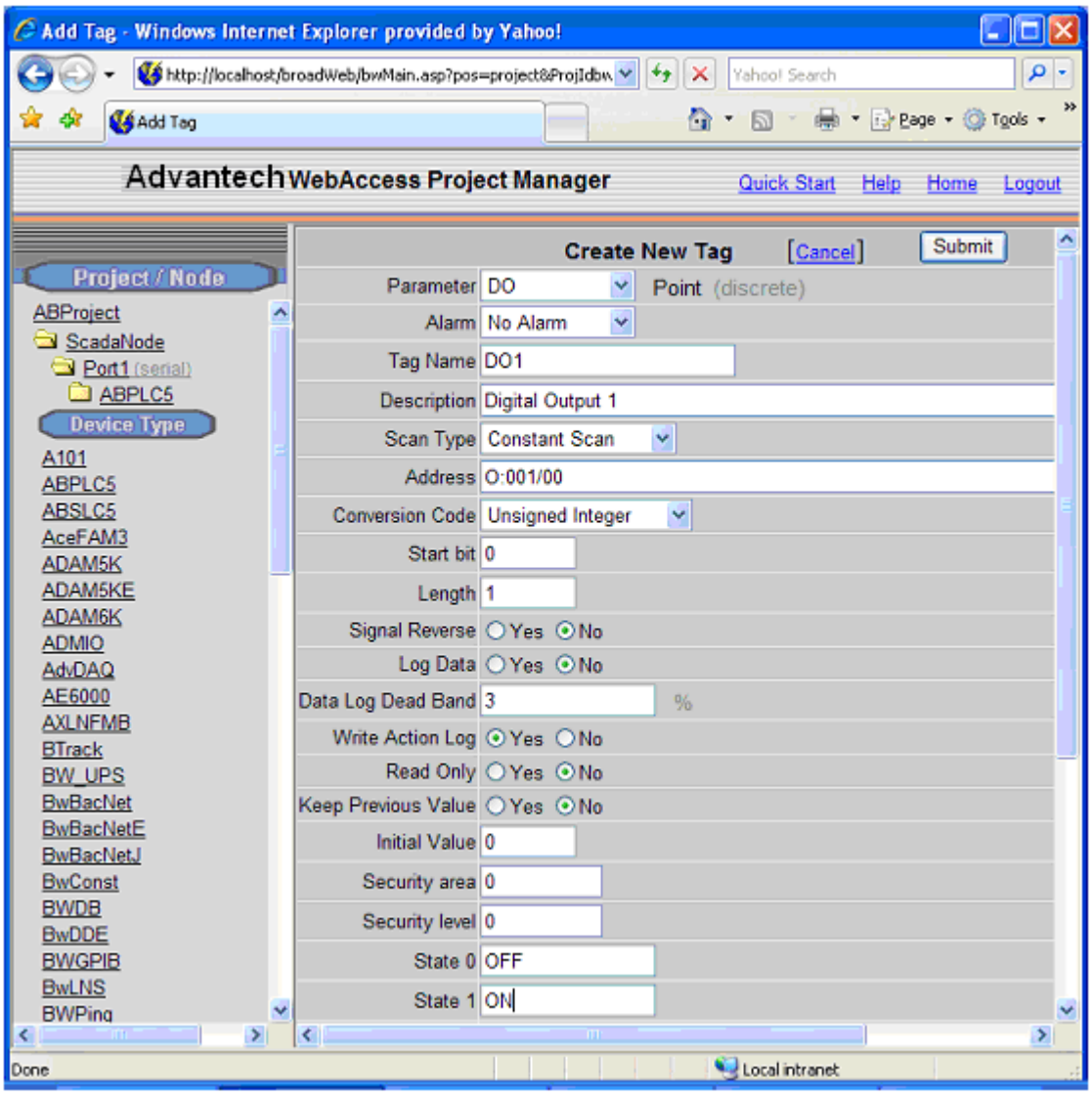
13. Optionally enter, Scaling, Span Hi, Span Low, Engineering Units, and Alarms; enable data logging, etc.

14. Press **Submit**.

4.2. Digital Tag

This example is to configure a Tag that writes a Digital Output (Address **O:001/000**).

15. Select the Allen-Bradley PLC5 **Device**.
16. Select **Add Tag**.
17. From **Parameter** Pull Down List Select **DO**. This will configure an Analog Input. Wait for the Page to update.
18. Optionally, select **ALARM** from the ALARM pull down list. Wait for the Page to update with a PINK highlight around alarm (an additional Alarm Fields at bottom of page).



19. Enter a **Tagname** users can use to identify this Analog Input measurement. For example, if this is a Flow measurement, enter **DO**.

20. Edit the **Address** to the actual address. From the example, Enter: **O:001/000**
21. Enter a Description. This will help identify this tag to Users and Operators. For example, enter DO-Relay.
22. Optionally enter, State 0 Description, State 1 Description, Alarms, enable data logging, etc. For example, State 0 = OFF and State 1 = ON.
23. Press **Submit**.

Congratulations! You have just configured a Measurement and Output Tags to Allen-Bradley device.

5. Appendix: ABSLC5 device

5.1. Parameter List

Parameter	Data Type	Description	Address format
AI	Analog	Analog Input	I:000
AO	Analog	Analog Output	O:000
B	Analog	Binary	B3:0
BT_DLEN	Analog	Blk Transmit Word Count	BT10:0.DLEN
BT_ELEM	Analog	Blk Word Num	BT10:0.ELEM
BT_FILE	Analog	Blk File-Type Num	BT10:0.FILE
BT_G	Analog	Blk I/O Group	BT10:0.RGS
BT_R	Analog	Blk I/O Rack	BT10:0.RGS
BT_RLEN	Analog	Blk Req. Word Count	BT10:0.RLEN
BT_S	Analog	Blk Slot	BT10:0.RGS
C_ACC	Analog	Counter Accumulated Value	C5:0.ACC
C_PRE	Analog	Counter Preset Value	C5:0.PRE

D	Analog	BCD	D10:0
F	Analog	Floating Point	F8:0
MG_DLEN	Analog	Message Res./Intern. Use	MG10:0.DLEN
MG_ERR	Analog	Message Error Code	MG10:0.ERR
MG_RLEN	Analog	Message Request Length	MG10:0.RLEN
N	Analog	Integer	N7:0
PD_BIAS	Analog	PID Output Bias %	PD10:0.BIAS
PD_DB	Analog	PID Dead Band	PD10:0.DB
PD_DVDB	Analog	PID Deviation Alarm DB	PD10:0.DVDB
PD_DVN	Analog	PID Deviation Alarm -	PD10:0.DVN
PD_DVP	Analog	PID Deviation Alarm +	PD10:0.DVP
PD_ERR	Analog	PID Error	PD10:0.ERR
PD_KD	Analog	PID Derivative Time	PD10:0.KD
PD_KI	Analog	PID Integral Gain	PD10:0.KI
PD_KP	Analog	PID Proportional Gain	PD10:0.KP
PD_MAXI	Analog	PID Input Range Maximum	PD10:0.MAXI
PD_MAXO	Analog	PID Output Limit High %	PD10:0.MAXO
PD_MAXS	Analog	PID Set-Point Maximum	PD10:0.MAXS
PD_MINI	Analog	PID Input Range Minimum	PD10:0.MINI

PD_MINO	Analog	PID Output Limit Low %	PD10:0.MINO
PD_MINS	Analog	PID Set-Point Minimum	PD10:0.MINS
PD_OUT	Analog	PID Output %	PD10:0.OUT
PD_PV	Analog	PID Process Variable	PD10:0.PV
PD_PVDB	Analog	PID PV Alarm Dead Band	PD10:0.PVDB
PD_PVH	Analog	PID PV Alarm High	PD10:0.PVH
PD_PVL	Analog	PID PV Alarm Low	PD10:0.PVL
PD_SO	Analog	PID Set Output %	PD10:0.SO
PD_SP	Analog	PID Set Point	PD10:0.SP
PD_TIE	Analog	PID Tieback %	PD10:0.TIE
PD_UPD	Analog	PID Update Time	PD10:0.UPD
R_LEN	Analog	Control Length	R6:0.LEN
R_POS	Analog	Control Position	R6:0.POS
S	Analog	Status	S:0
SC__PRE	Analog	SFC Preset Value	SC10:0.PRE
SC__TIM	Analog	SFC Active Time	SC10:0.TIM
ST_LEN	Analog	ASCII String Length	ST10:0.LEN
T_ACC	Analog	Accumulated Value	T4:0.ACC
T_PRE	Analog	Preset Value	T4:0.PRE
BT_CO	discrete	Blk Trans Continue	BT10:0.CO
BT_DN	discrete	Blk Trans Done	BT10:0.DN
BT_EN	discrete	Blk Trans Enable	BT10:0.EN

BT_ER	discrete	Blk Trans Error	BT10:0.ER
BT_EW	discrete	Blk Trans Enabled Waiting	BT10:0.EW
BT_NR	discrete	Blk Trans No Response	BT10:0.NR
BT_RW	discrete	Blk Trans Read/Write	BT10:0.RW
BT_ST	discrete	Blk Trans Start	BT10:0.ST
BT_TO	discrete	Blk Trans Time Out	BT10:0.TO
C_CD	discrete	Counter Down Enable	C5:0.CD
C_CU	discrete	Counter Up Enable	C5:0.CU
C_DN	discrete	Counter Done	C5:0.DN
C_OV	discrete	Counter Overflow	C5:0.OV
C_UN	discrete	Counter Underflow	C5:0.UN
DI	discrete	DI	I:000/00
DO	discrete	DO	O:000/00
MG_CO	discrete	Message Continuous	MG10:0.CO
MG_DN	discrete	Message Done	MG10:0.DN
MG_EN	discrete	Message Enable	MG10:0.EN
MG_ER	discrete	Message Error	MG10:0.ER
MG_EW	discrete	Message Enabled Waiting	MG10:0.EW
MG_NR	discrete	Message No Response	MG10:0.NR
MG_ST	discrete	Message Start Transmit	MG10:0.ST

PD_CA	discrete	PID Control Action	PD10:0.CA
PD_CL	discrete	PID Cascaded Loop	PD10:0.CL
PD_CT	discrete	PID Cascaded Type	PD10:0.CT
PD_DO	discrete	PID Derivative	PD10:0.DO
PD_DVNA	discrete	PID Dev High Alarm	PD10:0.DVNA
PD_DVPA	discrete	PID Dev Low Alarm	PD10:0.DVPA
PD_EN	discrete	PID Enable	PD10:0.EN
PD_EWD	discrete	PID Error Within DB	PD10:0.EWD
PD_INI	discrete	PID Initialized	PD10:0.INI
PD_MO	discrete	PID Station (auto/manual)	PD10:0.MO
PD_OLH	discrete	PID Output Limit High	PD10:0.OLH
PD_OLL	discrete	PID Output Limit Low	PD10:0.OLL
PD_PE	discrete	PID Equation Type	PD10:0.PE
PD_PVHA	discrete	PID PV High Alarm	PD10:0.PVHA
PD_PVLA	discrete	PID PV Low Alarm	PD10:0.PVLA
PD_PVT	discrete	PID PV Tracking	PD10:0.PVT
PD_SPOR	discrete	PID SP Out of Range	PD10:0.SPOR
PD_SWM	discrete	PID Software A/M Mode	PD10:0.SWM
R_DN	discrete	Control Done	R6:0.DN

R_EM	discrete	Control Empty	R6:0.EM
R_EN	discrete	Control Enable	R6:0.EN
R_ER	discrete	Control Error	R6:0.ER
R_EU	discrete	Control Enable Unloading	R6:0.EU
R_FD	discrete	Control Found	R6:0.FD
R_IN	discrete	Control Inhibit Compare	R6:0.IN
R_UL	discrete	Control Unload	R6:0.UL
SC_DN	discrete	SFC Done	SC10:0.DN
SC_ER	discrete	SFC Step Eroded	SC10:0.ER
SC_FS	discrete	SFC First Scan	SC10:0.FS
SC_LS	discrete	SFC Last Scan	SC10:0.LS
SC_OV	discrete	SFC Timer Overflow	SC10:0.OV
SC_SA	discrete	SFC Scan Active	SC10:0.SA
T_DN	discrete	Timer Done	T4:0.DN
T_EN	discrete	Timer Enable	T4:0.EN
T_TT	discrete	Timer Timing	T4:0.TT
ST	text	ASCII String	ST10:0