LNS
to LONWorks
Device Driver Guide

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Rev 1 – May 19, 2004
Rev 2 – May 20, 2004
Rev 3 – August 3, 2004 – LON_MAP.INI for user customized conversion of STATE Descriptors.
Rev 4 – Sept 1, 2004 – Added LonWorks details corrected for determining LNS Interface, Subsystem, Database and Network Variables naes.

1. LNS to LONWorks Device Communications

1.1 Introduction to LNS driver to LONWORKS devices

Advantech WebAccess SCADA Node can use an LNS interface to communicate to LONWORKS devices. The SCADA node requires LNS software be installed on the SCADA node PC. LNS can use either a Remote Network Interface (RNI) or a LonWorks communication card installed on the SCADA node PC to communicate on the LONWorks network.

This LNS interface can be a network interface card or device such as the PCC-10, PCLTA-10, PCLTA-20, PCNSI, SLTA-10, or PL-SLTA. This could also be a Remote Network Interface (RNI) using the i.LON10 or iLON100 with LNS on the PC

AN LNS Interface must be configured on the SCADA Node (see section 1.3.2.10 View LNS Network Interface Names).

The Advantech WebAccess Tags are configured using the programmatic name of the NVs or CPs of the LonWorks Devices as 'addresses' in the Advantech WebAccess Tags. (See section 1.4.1 Addresses).

Note – a copy of LNS is required on the SCADA node.

Note 2- LonMaker is required to configure the LONWORKS devices, but the SCADA node does not require LonMaker. LonMaker can be on a separate PC.

The Advantech WebAccess LNS device driver can read and write network variables (nvi and nvo) and configuration parameters (cp). In other words, the Advantech WebAccess LNS driver communicates to snivets and scipets.

The Advantech WebAccess LNS driver uses a unique port type named LNS. This port is really an API interface to LNS and can use a local LonWorks Network card or an RNI. It does not need to match an actual COM port number.

1.2 Performance

To enhance the speed of communications between Advantech WebAccess, LNS and the LonWorks devices, the following are recommended

1.2.1 Host Network variable

1. For each device input network variable, create a host network variable in the opposite direction, and connect these 2 network variables using LonMaker.

2. Create Advantech WebAccess tag to for the Host NV and do not use "/U" option and set scan type as constant scan.

3. In device configuration, add "/H" for host device name.

1.2.2 Bound Update for input network variable (if no Host NV)

Use Bound Update for device input network variable if no Host NV is available.

For each device input network variable without Host NV, create Advantech WebAccess Tag with "/U" option and set scan type as constant scan.

This r4commendation is for Inputs (i.e. measurements and status). It is not recommended to use bound updates for outputs (i.e. writes from Advantech WebAccess to the device)

1.2.3 For NV and CP used in Alarms and Trends

1.2.3.1 /U Option – Bound Update with Scan Time for port

For variables needed to be monitored as an **alarm,** for **trending** or **data logging**, create Advantech WebAccess tag without "/U" option, and set scan type as constant scan. Advantech WebAccess will scan these tags at scan rate as "scan time" in port configuration. (See section 1.4.1 Addresses).

1.2.3.2 /Vnn Option – Individual Tag Scan Time

If higher scan rate is desired for variables needed to be monitored as an alarm or for trending, use "/Vnn" at end of address field. This means scan this tag at 0.1*nn second, nn can be from 1 to 60000.

(See section 1.4.1 Addresses).

1.2.4 Use Display SCAN when possible

For all other tags (that are not trended, data logged or alarmed), create Advantech WebAccess tag without "/U" option and set scan type as display scan.

1.2.5 Network traffic

The Network traffic is determined by:

1. The Network variable change frequency on tags configured in 1.2.1 and 1.2.2 (e.g. Host Network Variables and Bound Network Variables).

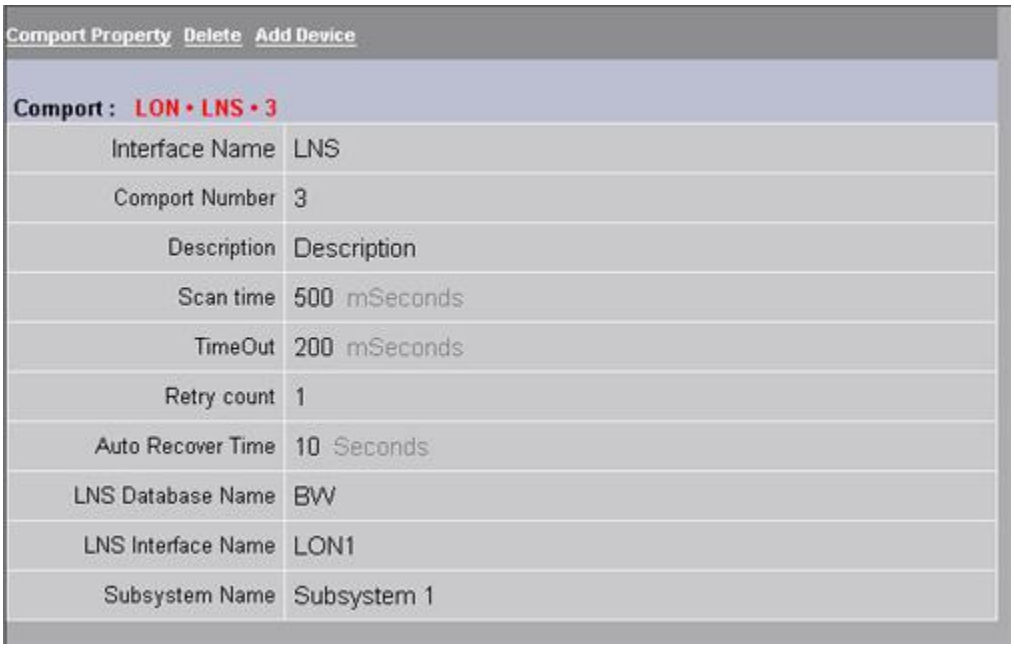
2. The Number of constant scan tags in 1.2.3 and scan rate on these tags. (e.g. Number Tags used in Alarms, data logging and Trends).

1.3 LNS Comport and device in Advantech WebAccess

1.3.1 Configure an LNS Comport and Device

The steps, in summary, are:

1. Start Internet Explorer **Web Browser**.
2. Enter IP address of the **Project Node**.
3. Use **Advantech WebAccess Configuration**.
4. Open or Create a **Projec**t.
5. Configure a **SCADA node** (the PC that will connect to the automation hardware).
6. Configure a **Comport** for the SCADA Node that is an **LNS** type Comport.



7. Configure **Scan Time**, **Timeout, Retry** and **Auto Recover**.

   See 1.3.2 LNS Comport Properties in the following section for more information.

8. **LNS Interface Name**: Enter Interface Name in LNS database

   The name is case sensitive, must match name in LNS database.

   See 1.3.2.7 LNS Interface Name and 1.3.2.10 View LNS Network Interface Names for more information.

9. **LNS Database Name**: Enter LNS database Name.
   The name is case sensitive, must match name in LNS database.

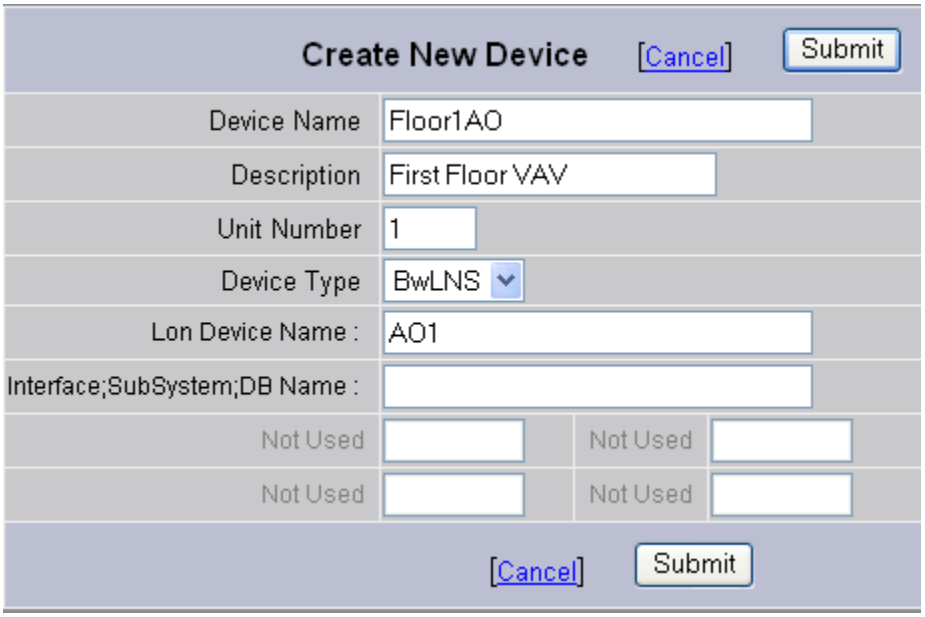
   See 1.3.2.8 LNS Database Name and 1.3.2.10 View LNS Network Interface Names for more information.

10. **Subsystem Name**: Enter Subsystem Name if all devices on this comport use the same subsystem. The name is case sensitive, must match name in LNS database.

    See 1.3.2.9 Subsystem Name and 1.3.2.10 View LNS Network Interface Names for more information.

11. Press **Submit**.

12. Configure an LNS Device (determines the communications Protocol or Device Driver) using **Add Device.**



13. Select the **Device Type** is **BwLNS**

14. **LON Device Name**: Enter LNS device name. This is case sensitive.

15. Optionally enter Interface;SubSystem;DB Name .

16. Press **Submit**.

17. Use **Add Tag** or **Add Block** to create tags from Device Properties.

1.3.2 LNS Comport Properties

1.3.2.1 Comport Number

The LNS Comport is a virtual comport. There is no need to match that of the physical interface (e.g. COM1, COM2, COM3, etc) on the SCADA Node. It is recommended to use a Port > 3 to avoid conflict with an actual serial port.

1.3.2.2 Description

This is an optional field used for user reference.

1.3.2.3 Scan Time

This is the time in milliseconds to scan the LONWorks Network and LNS. This must match the ability of the LONWORKS network to respond.

If the LONWORKS network and devices cannot respond as fast as the SCAN Time entered, Advantech WebAccess will scan at a slower rate.

It is possible to scan some tags faster by using the /Vnn option. See For other NV and CP used in Alarms and Trends. See Performance for more information.

1.3.2.4 Timeout

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

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 3 seconds, longer if the communication device is slow. This is protocol dependent: some protocols do not allow changes in time out.

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. The slow or poor quality communications require longer timeout. The faster the communications network or device, the shorter the timeout required. Shorter timeouts notify operators of communications failure more quickly.

1.3.2.5 Retry Count

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.

In addition, Indicates the number of times after the first attempt has failed that communication should be attempted before indicating a failure. Specifically, 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.

1.3.2.6 Auto Recover Time

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 Advantech WebAccess try to re-establish communications sooner.

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

1.3.2.7 LNS Interface Name

Enter Interface Name in LNS database. All the names are case sensitive, must match name in LNS.

To determine the name of the LNS Interface(s) configured n the SCADA node, see 1.3.2.10 View LNS Network Interface Names.

1.3.2.8 LNS Database Name

Enter LNS database Name. All the names are case sensitive, must match name in LNS database.

To determine the name of the LNS Interface(s) configured n the SCADA node, see 1.3.2.10 View LNS Network Interface Names.

1.3.2.9 Subsystem Name

Enter Subsystem Name. All the names are case sensitive, must match name in LNS database.

To determine the name of the LNS Interface(s) configured n the SCADA node, see 1.3.2.10 View LNS Network Interface Names.

1.3.2.10 View LNS Network Interface Names

If you plan on attaching to a network, you must define and configure your network interface on the SCADA node.

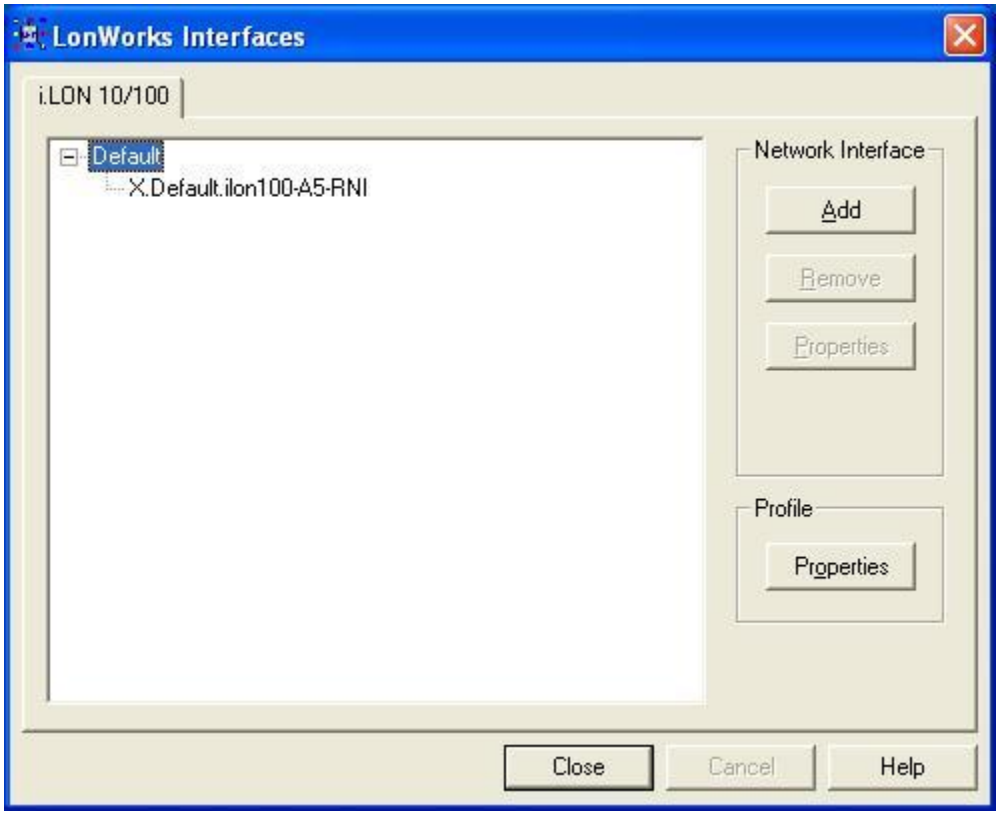
This interface can be a network interface card or device such as the PCC-10, PCLTA-10, PCLTA-20, PCNSI, SLTA-10, or PL-SLTA.

This could also be a Remote Network Interface (RNI) using the i.LON10 or iLON100 with LNS on the PC

To view an LNS interface follow these steps (LNS must be installed on the PC):

1. Open the **Control Panel**.
   In Windows 2000: Start -> Settings -> Control Panel.
   In Windows XP: Start -> Control Panel.

2. Open the **LonWorks Interfaces** control panel application.



3. Select the **Name** of the interface.

4. Under **Profile**, select **Properties**.

5. The Database and Subsystem Name(s) appear.

6. Select OK.

1.3.2.11 View LNS Database Names

To View the name of the databases on the local computer:

1. Start **LonMaker for Windows**.
   Start -> Programs -> Echelon LonMaker for Windows -> LonMaker for Windows.

2. The **LonMaker Design Manager** opens.

3. There is a drop-down menu next to **Database Name:** that lists all the databases configured.

1.3.2.12 View LNS subsystem Names

To View the name of the databases on the local computer:

1. Start **LonMaker for Windows**.
   Start -> Programs -> Echelon LonMaker for Windows -> LonMaker for Windows.

2. The **LonMaker Design Manager** opens.

3. There is a drop-down menu next to **Database Name:** that lists all the databases configured.

4. Select the **Database** you want to use.

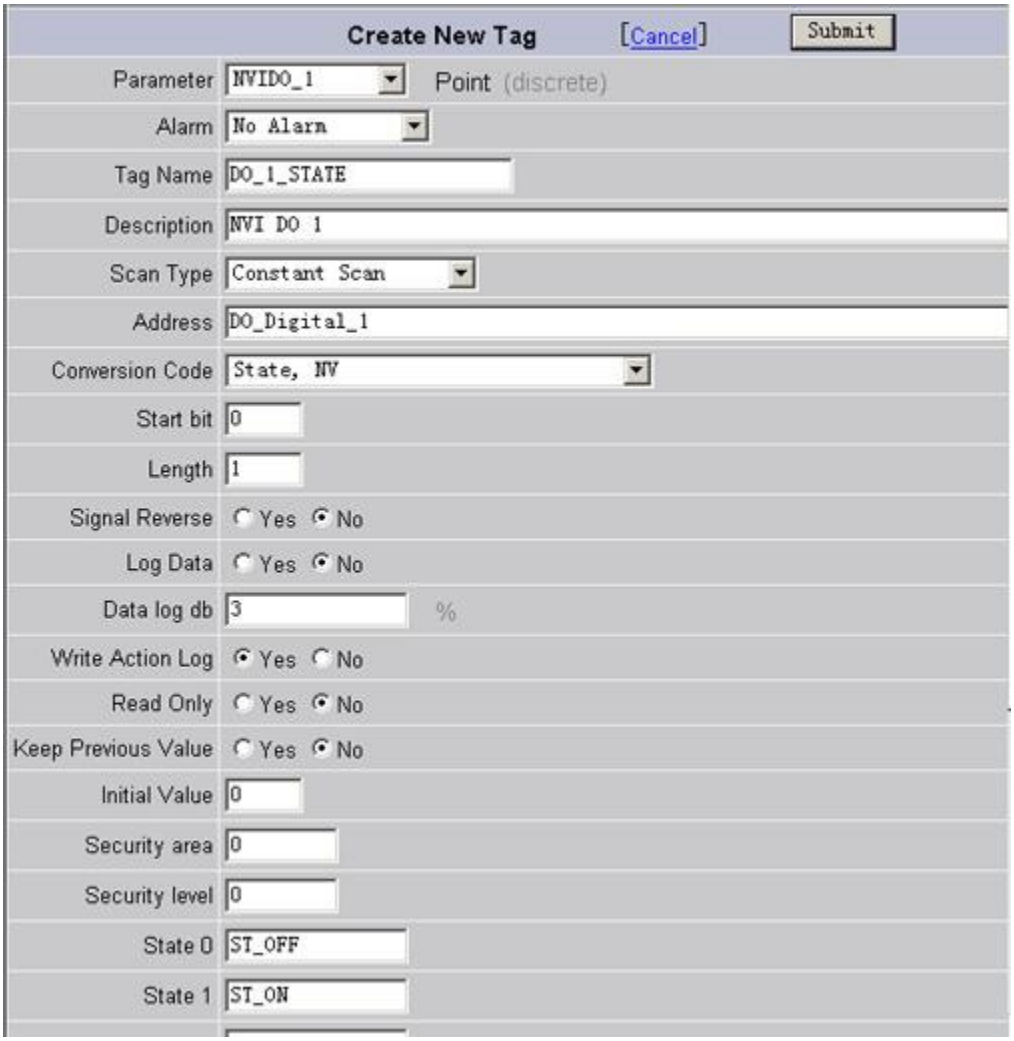
5. Select the **Open Network** pushbutton.

6. Visio should open.

7. The mane of the subsystem is listed at in the Title bar of the Visio and on a Tab at the bottom of the Drawing.

Hint – Usually the name is Subsystem 1 (and there is usually a space before the one).

1.4 Configure a TAG



18. Use **Add Tag** to create tags from Device Properties page.

19. Select a **Parameter** to match the type of data to be read or written (Analog Input, Analog Output, Digital Input, Digital Output).

    An indication of what a parameter does is to look at the conversion code and address. A Parameter is intended as a template or shortcut to guide you in configuring a point. The Description field is also a good indication of the intended use for this parameter.

    The Data type is the only thing you can not change later. Be sure if you are using a floating point number or an integer greater than 1 byte to use an analog data type: Point (analog)

    Use a Discrete data type for on/off and 8-state discrete: Point (discrete)

    Use a Text data type for Text: Point (text).

20. Modify the **Address**. The **Address** of the data must match the NV or CP. Modify the Address to match the actual NVL_programmatic name. Enter the NV, CP or Lonmark NV, CP name.

    To parse part of the variables, you can append an option. (See section 1.4.1 Addresses).

21. Apply a **Conversion Code.**

    For more information see section 1.4.2 Conversion Code.

22. Apply a **Tag name**.

23. Press **Submit**.

24. Edit Tags in Project Manager to assign **Alarms**, **Scaling**, **Engineering Units**, Description and other features.

25. **Download** to the SCADA node.

1.4.1 Addresses

The **Address** of the data must match the NV or CP. Modify the Address to match the actual NVL_programmatic name. Enter the NV, CP or Lonmark NV, CP name.

To parse part of the variables, append the following options to the Address

Append an "**,n**" to the address if the tag fetches only the n^{th} field of the returned data, default is 1.

Append "**/D=x**" if a delimiter is not a space in the multiple field return data. 'x' is the delimiter.

Append "**/D=Xnn**" if a delimiter is not an alphanumeric character, where nn is a hexadecimal number. For example, a 'TAB' is 09.

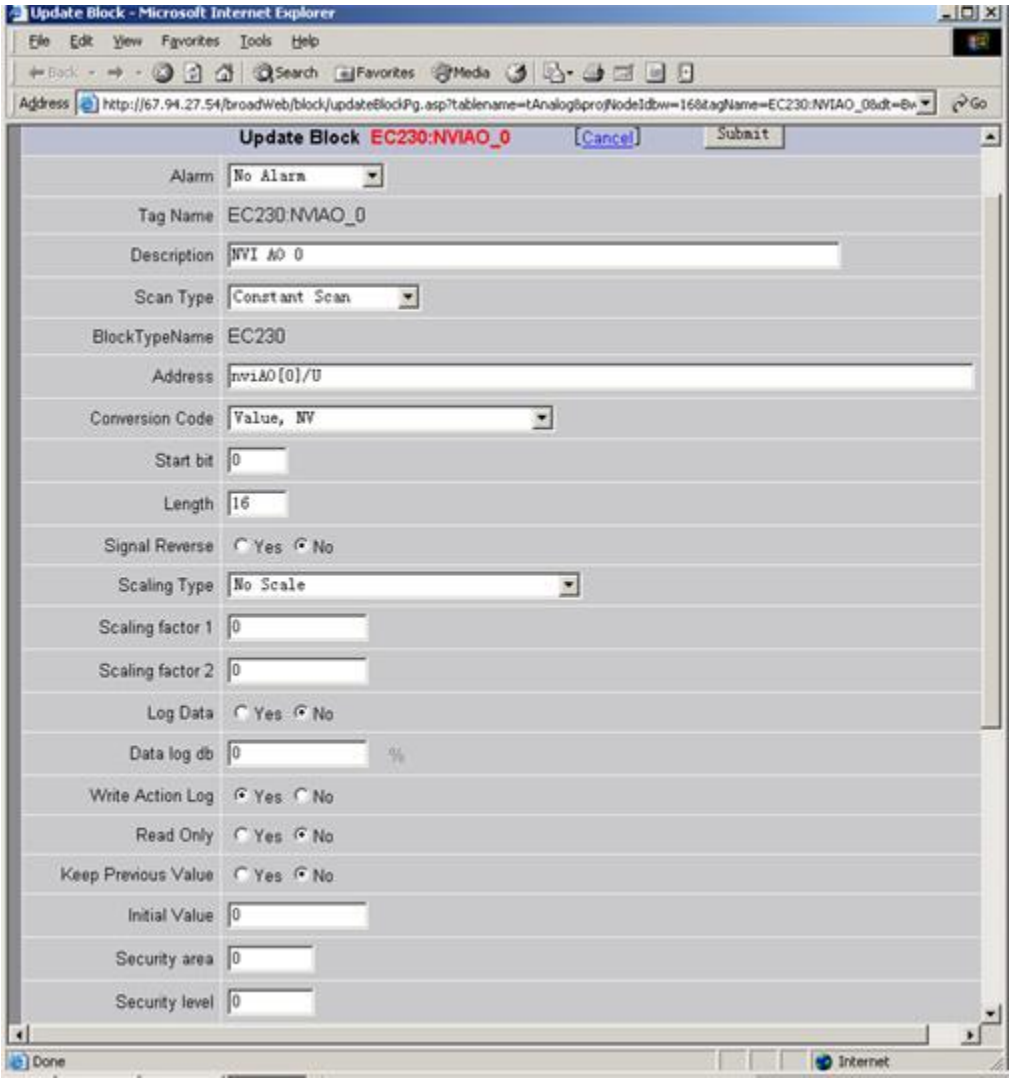
Append **"/D=A**" if all non-alphanumeric character are considered to be delimiters.

Append "**/U**" if a NV with bound update is desired for the data update from the device.

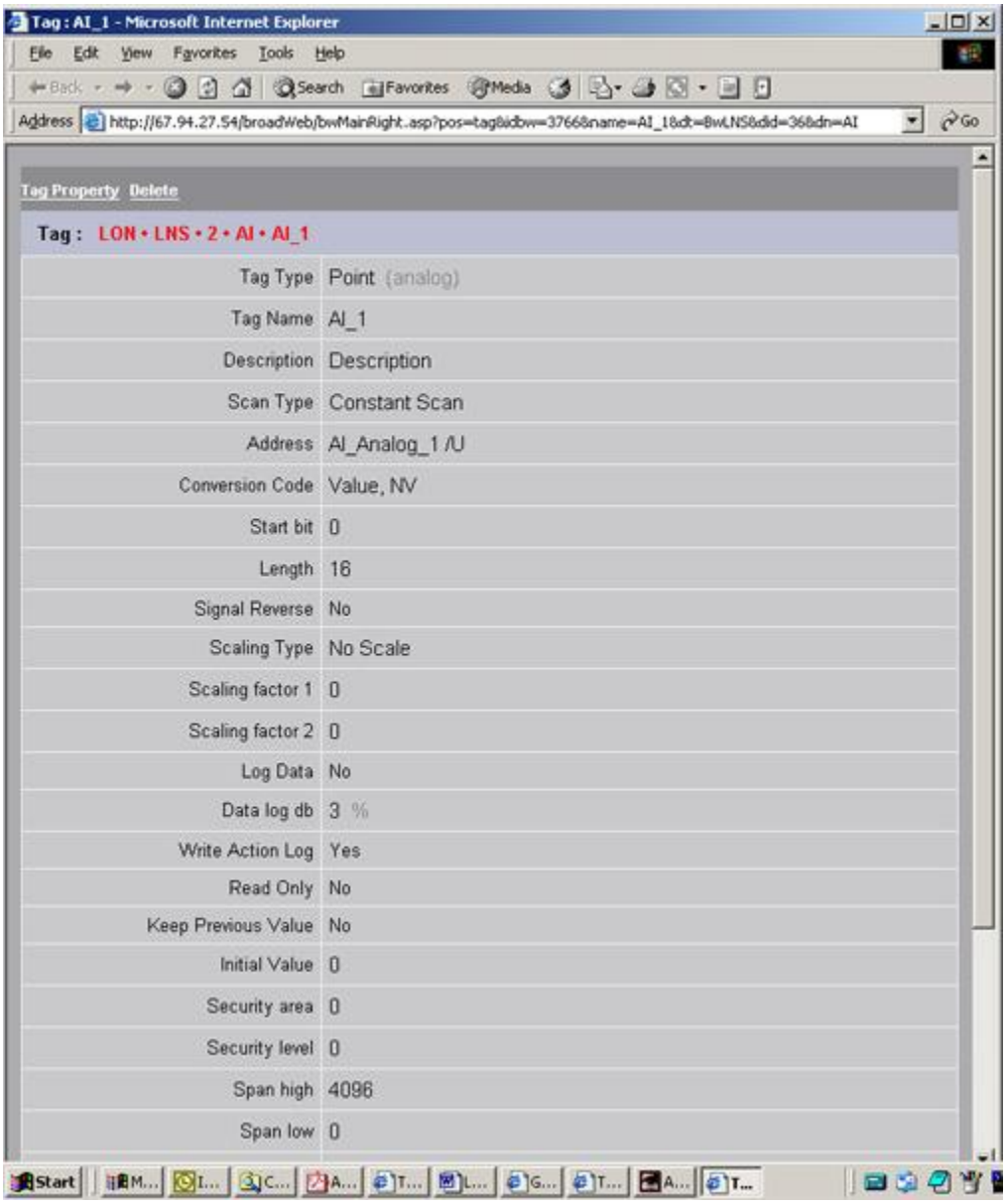
Append "**/Vnn**", nn=1-60000. If LNS polling is desired, polling time is 0.1 * nnn second.

1.4.1.1 Example Addresses

Address example	Description	Value Used
Analog Input[0].AI_Analog_1.SCPTmaxRnge	The maximum of AI 1 of AI-10 module	LMOBJ_NV_CP
AI_Analog_1 /U	AI 1 of AI-10 module, with Bound update	NV
DO_Digital_1	DO 1 value of DIO-10 module "1.0" of the return data "1.0 1".	NV
DO_Digital_1,1	DO 1 state of DIO-10 module "1" of the return data "1.0 1".	NV
nviAO[0]/U	AO 0 of EC230, with bound update.	NV



Example **- nviAO[0]/U** : AO 0 of EC230, with bound update. Uses **Value, NV**



Example **- AI_Analog_1 /U** : AI 1 of AI-10 module, with Bound update. Uses **Value, NV**.

1.4.2 Conversion Code

The conversion code is used to interpret the data as integer, floating point, discrete state, or text.

"Value, NV", "Value, CP", "Value, NV_CP", "Value, LMOBJ_CP" and "Value, LMOBJ_NV_CP" are used for read integer or floating point value form NV, CP, NV_CP, Lonmark Object CP and Lonmark NV_CP.

"STATE, NV", "STATE, CP", "STATE, NV_CP", "STATE, LMOBJ_CP" and "STATE, LMOBJ_NV_CP" are used to convert a discrete state text to a discrete tag

value. The descriptor of the discrete tag's state match with the reading, the value of the state is used.

"Text, NV", "Text, CP", "Text, NV_CP", "Text, LMOBJ_CP" and "Text, LMOBJ_NV_CP" are used for TEXT data of readings.

1.4.3 Blocks

Currently, only 1 block type, EC230, has been pre-configured.

1.4.3.1 Block Offset

Enter the block name and enter '*' in the offset field, all the NVs in the EC230 will be added to Advantech WebAccess database.

1.5 Parameters

Advantech WebAccess will add more parameters and block type definitions for other devices soon.

The current Parameters are:

Parameter Name	Description	Address	Scan Type	Conversion Code
NVIAO_0	NVI AO 0 An analog output to LonWorks device from Advantech WebAccess with Bound Update	nviAO[0]/U	Constant Scan	Value, NV
NVIAO_1	NVI AO 1 An analog output to LonWorks device from Advantech WebAccess with Bound Update	nviAO[1]/U	Constant Scan	Value, NV
NVIAO_2	NVI AO 2 An analog output to LonWorks device from Advantech WebAccess with Bound Update	nviAO[2]/U	Constant Scan	Value, NV
NVIAO_3	NVI AO 3 An analog output to LonWorks device from Advantech WebAccess with Bound Update	nviAO[3]/U	Constant Scan	Value, NV
NVOAI_0	NVO AO 0 An analog Input	nvoAI[0]/U	Constant Scan	Value, NV

Parameter Name	Description	Address	Scan Type	Conversion Code
	from LonWorks device to Advantech WebAccess with Bound Update			
NVOAI_1	NVO AO 1 An analog Input from LonWorks device to Advantech WebAccess with Bound Update	nvoAI[1]/U	Constant Scan	Value, NV
NVOAI_2	NVO AO 2 An analog Input from LonWorks device to Advantech WebAccess with Bound Update	nvoAI[2]/U	Constant Scan	Value, NV
NVOAI_3	NVO AO 3 An analog Input from LonWorks device to Advantech WebAccess with Bound Update	nvoAI[3]/U	Constant Scan	Value, NV
NVIDO_0	NVI DO 0 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[0]/U	Constant Scan	State, NV
NVIDO_1	NVI DO 1 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[1]/U	Constant Scan	State, NV

Parameter Name	Description	Address	Scan Type	Conversion Code
NVIDO_2	NVI DO 2 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[2]/U	Constant Scan	State, NV
NVIDO_3	NVI DO 3 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[3]/U	Constant Scan	State, NV
NVIDO_4	NVI DO 4 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[4]/U	Constant Scan	State, NV
NVIDO_5	NVI DO 5 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[5]/U	Constant Scan	State, NV
NVIDO_6	NVI DO 6 A Discrete Output to LonWorks device from Advantech WebAccess with Bound Update	nviDO[6]/U	Constant Scan	State, NV
NVODI_0	NVO DI 0 A Discrete Input from LonWorks device to Advantech WebAccess	nvoDI[0]/U	Constant Scan	State, NV

Parameter Name	Description	Address	Scan Type	Conversion Code
	with Bound Update			
NVODI_1	NVO DI 1 A Discrete Input from LonWorks device to Advantech WebAccess with Bound Update	nvoDI[1]/U	Constant Scan	State, NV
NVODI_2	NVO DI 2 A Discrete Input from LonWorks device to Advantech WebAccess with Bound Update	nvoDI[2]/U	Constant Scan	State, NV
NVODI_3	NVO DI 3 A Discrete Input from LonWorks device to Advantech WebAccess with Bound Update	nvoDI[3]/U	Constant Scan	State, NV
NVODI_4	NVO DI 4 A Discrete Input from LonWorks device to Advantech WebAccess with Bound Update	nvoDI[4]/U	Constant Scan	State, NV
NVODI_5	NVO DI 5 A Discrete Input from LonWorks device to Advantech WebAccess with Bound Update	nvoDI[5]/U	Constant Scan	State, NV
NVODI_6	NVO DI 6 A Discrete Input from LonWorks device to	nvoDI[6]/U	Constant Scan	State, NV

Parameter Name	Description	Address	Scan Type	Conversion Code
	Advantech WebAccess with Bound Update			

1.6 Error Codes

The following error codes are returned during runtime in View or ViewDAQ and can be viewed from the Point Info Dialog box.

0x9000	LNS database error
0x9800	LNS database error
0x9010	Get Database Name error
0x9015	Database Name error
0x9020	Configured Database Name does not in the LNS database
0x9100	Get Interfaces Error
0x9102	Network interface name error
0x9105	Get subsystem collections error
0x9110	Get subsystems error
0x9115	Get Network service error
0x9120	Initialize subsystems error
0x9200	Get Subsystem error
0x9210	GetAppDevices error
0x9300	Get Device error, device name error
0x8081	NV error
0x8082	No NV defined
0x8085	Get Lonmark objects error
0x8086	Get Lonmark NV collection error
0x8087	Get Lonmark NV error
0x8011	Get NV Value error

0x8021	Get CP error
0x8121	Get NV of NV_CP error
0x8122	Get NV_CP collection error
0x8123	GET CP of NV_CP error
0x8124	Get Lonmark Objects error
0x8125	Get CP collection error
0x8126	Get Lonmark CP error
0x8127	Get Lonmark Objects error
0x8128	Get Lonmark Objects NV collection
0x8129	Get Lonmark Objects NV error
0x812A	Get Lonmark Objects NV CP collection error
0x812B	Get Lonmark Objects NV CP error
0x8091	Get CP value error
0x9400	Get Device state error
0x950x	Device not online
0xB001	Parameter number or delimiter error
0xB011	Parameter number or delimiter error if /DA option is used
0xB002	Can not match discrete descriptor for STATE conversion type

2. Custom STATE Descriptors

2.1 LON_MAP.INI

The User can create custom STATE conversions by modifying the LON_MAP.INI file. This applies to Discrete type Tags (i.e. ON/OFF, ST_ON/ST_REQ/ST_OFF). The Advantech WebAccess STATE Descriptor appears on Displays, Alarms and in the Change Dialog Box pushbuttons. These correspond to the tag fields .DESCR0, .DESCR1, .DESCR2, .DESCR3, .DESCR4, .DESCR5, .DESCR6, and .DESCR6.

The user creates pairs of LON STATE Descriptors and Advantech WebAccess State Descriptors.

An Example LON_MAP.INI is as follows:

```
[DEAFULT_MAP]
Total_Item=3
MAP_1=ST_ON,ON
MAP_2=ST_OFF,OFF
Map_3 = 100.0 1,ON

Total_Group = 2

[Group_1]
Total_Item=2
Map_1 = 100.0 1,FAN_ON
Map_2 = 0.0 0,FAN_OFF

[Group_2]
Total_Item=2
Map_1 = 100.0 1,POWER_ON
Map_2 = 0.0 0,POWER_OFF
```

2.1.1 Default Lookup Group (DEFAULT_MAP)

All the STATE conversion will first look into the DEFAULT_MAP section for data from LNS server. If a matched entry has been found, say, "100.0 1", then "ON" will be used to match the point's descriptors to get correct value for the Discrete tags STATE Descriptor. So, instead of using 100.0 1 as descriptor, the operator will see a more friendly descriptor for the tag (e.g. "ON").

Use Default Lookup Group" conversion code is used for the conversion in the DEFAULT_MAP section. The LNS user can edit this section. This section is shared with iLON100 driver. If you have both device types on a SCADA node, you may want to modify the Default_Map for the LNS device and use Group_1 to 10 for the iLON100.

Group_1 to10 – not for LNS

Group_1 to Group_10 is for the ILON100 driver. These are not used by the LNS device driver.

2.1.2 Applying the Conversion Code to a Tag

In configuring the Discrete Tag in Advantech WebAccess to communicate with an LNS device, the user will see not see the words "Default_MAP" in the drop-down menu for conversion code. Instead, any STATE Descriptors pairs defined in the DEFAULT_MAP section of the LON_MAP.INI will apply if one the STATE conversion codes are selected (e.g. State, NV; State, CP; State, NV.CP; State, LonMark Object, CP; State, LonMark Object, NV, CP).

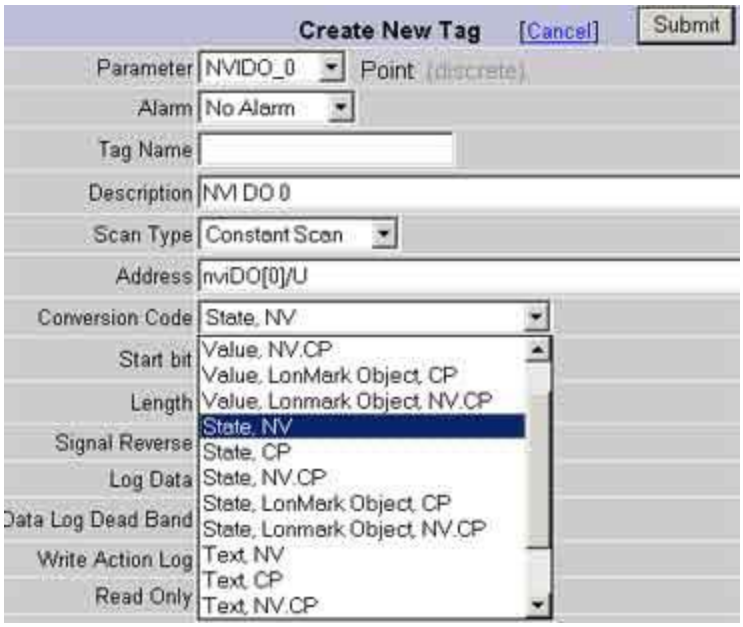


Figure – State conversion codes for LNS device

If the user selects on of the STATE conversion codes, the newly defined State Descriptors in LON_MAP.INI will be applied to do the conversion for that tag.