red lion

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DNP3 Master Communications Drivers

Information Sheet for Crimson v3.0+

Compatible Devices

DNP3 Serial or Ethernet slave device.

Verified Device

Invensys/Foxboro SCD5200

General Information

A Red Lion Graphite HMI or Graphite Controller device is mandatory when using a DNP3 communications driver.

Serial Configuration

In Crimson's Communications category select the desired serial port in the Communications tree and click on the Pick… button.
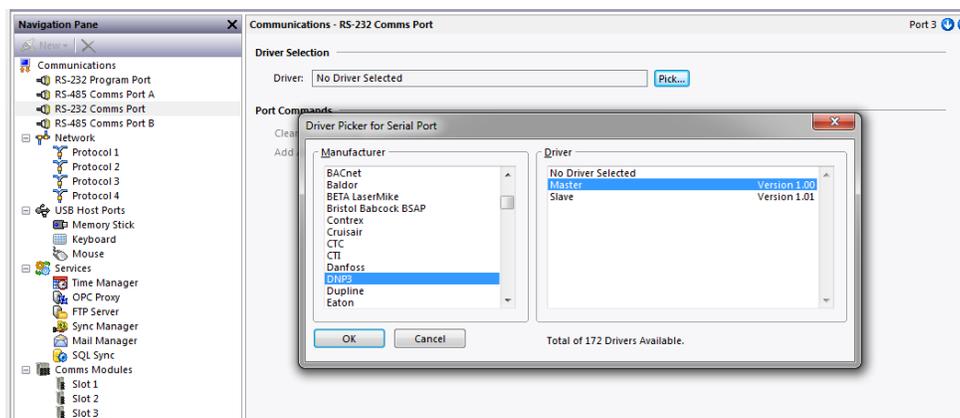

Select the DNP3 Master communication's driver as shown above and click OK.
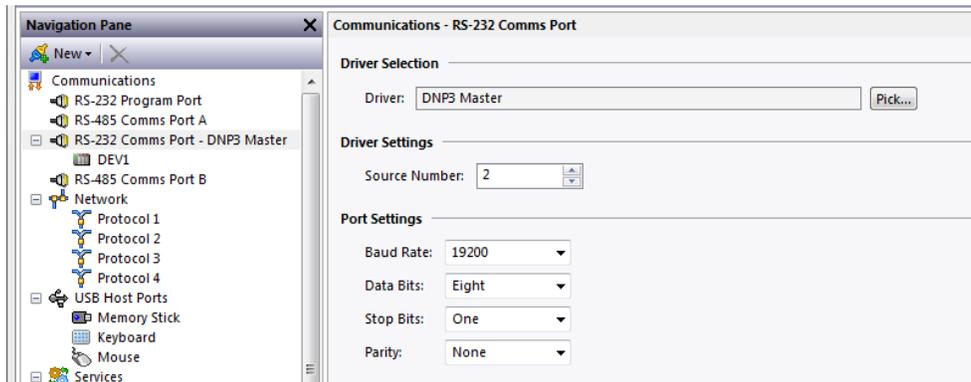
The Source Number setting will serve as an identifier for the Red Lion device on the DNP3 network. Set the Source Number to a number that does not currently exist on the network.

Modify the Baud Rate, Data Bits, Stop Bits and Parity as necessary to match the current settings of the DNP3 network.

Next click on the device element (in this case DEV1) of the communications port item in the Communications tree.
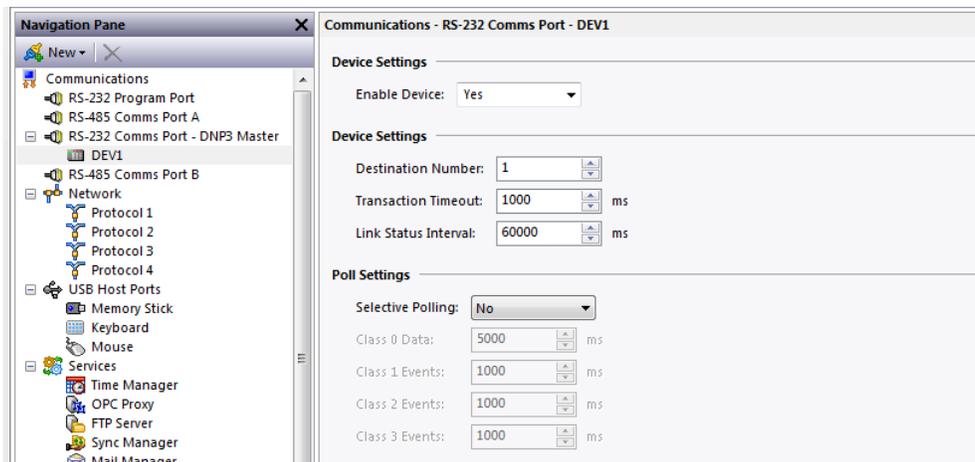
Set the Destination Number according to the DNP3 network identifier of the target device.

Adjust, if necessary, the Transaction Timeout and the Link Status Interval time constraints.

The Link Status Interval specifies the interval (in milliseconds) that the Link Status should be requested. It is possible to disable this feature by setting the time value to zero.

Enable Selective Polling to control data scanning intervals based on static or event data class. If Selective Polling is not used all values will be requested on each communications scan.

Ethernet Configuration

In Crimson's Communications category select an available Protocol in the Network element of the Communications tree and click on the Pick... button.
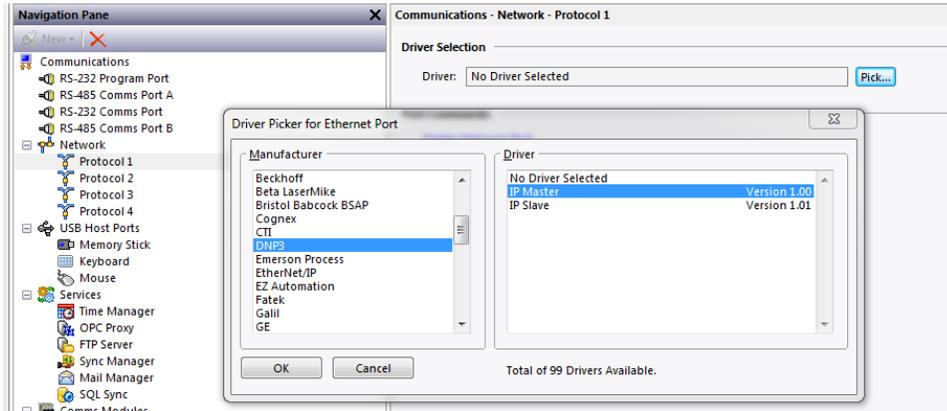
Select the DNP3 IP Master communication's driver as shown above and click OK.
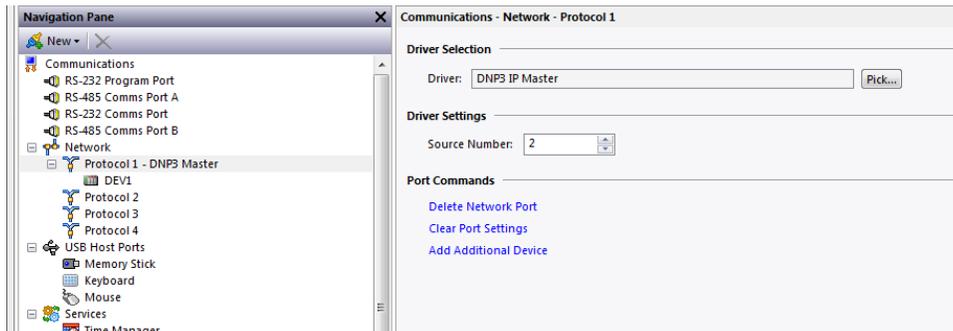
The Source Number setting will serve as an identifier for the Red Lion device on the DNP3 network. Set the Source Number to a number that does not currently exist on the network.

Next click on the device element (in this case DEV1) of the communications port item in the Communications tree.
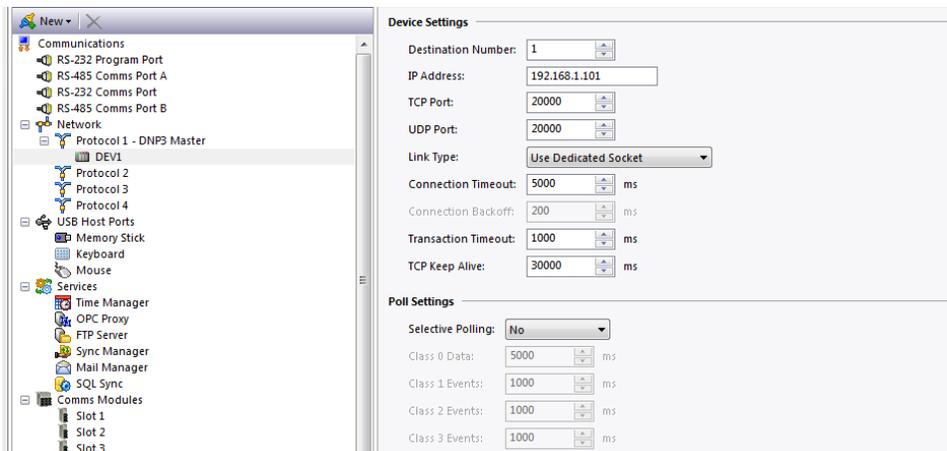
Set the Destination Number to according to the DNP3 network identifier of the target device.

Set the IP Address, TCP Port and UDP port according to the configuration of the target device.

The TCP Keep Alive specifies the interval (in milliseconds) that the Link Status should be requested.

Enable Selective Polling to control data scanning intervals based on static or event data class. If Selective Polling is not used all values will be requested on each communications scan.

Also, ensure that the Red Lion device's Ethernet Port Settings are configured - please refer to the **NETWORK CONFIGURATION** section within the Crimson manual.

Data Access

In Crimson's Tag Category create a tag then using the Source drop down select the DNP3 device.
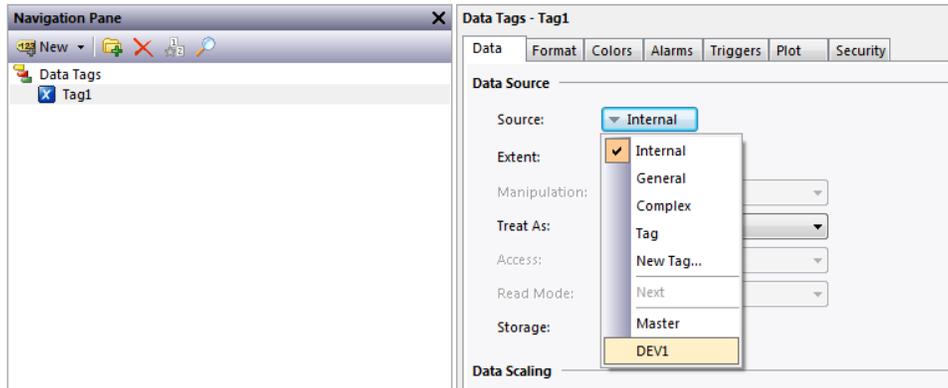
Red Lion provides data access to the following items in the "Select Address for DNP3 Master" dialog box:

Data Item	DNP3 Object Group	DNP3 Event Group
Binary Inputs	1	2
Double-bit Inputs	3	4
Binary Outputs	10 / 12	11
Counters	20	22
Frozen Counters	21	23
Analog Inputs	30	32
Analog Outputs	40 / 41	42
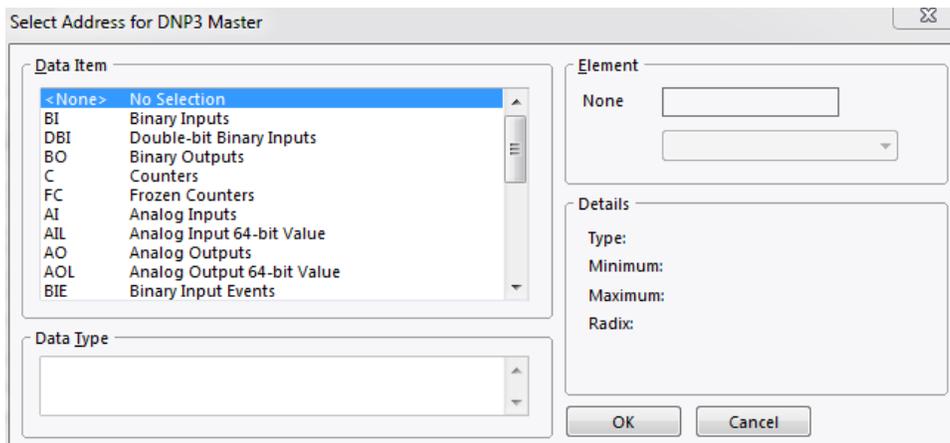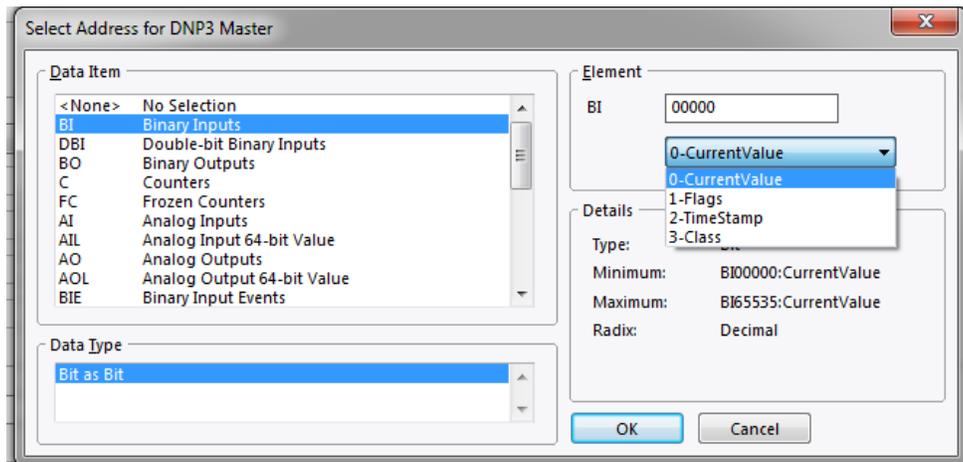
The following attributes and action items are available as indicated:

Current Value or **Control** - The latest value received from the target device. Access is read-only with the exception of non-event Binary Output and Analog Output items.

Flags – Read only bit mask indicating status -definition is as follows:

Binary items:
- Bit 0 – Online
- Bit 1 – Restart
- Bit 2 – Communications Lost
- Bit 3 – Remote Forced
- Bit 4 – Local Forced
- Bit 5 – Chatter

Counters:
- Bit 0 – Online
- Bit 1 – Restart
- Bit 2 – Communications Lost
- Bit 3 – Remote Forced
- Bit 4 – Local Forced
- Bit 5 – Rollover

Analogs:
- Bit 0 – Online
- Bit 1 – Restart
- Bit 2 – Communications Lost
- Bit 3 – Remote Forced
- Bit 4 – Local Forced
- Bit 5 – Check Reference

Timestamp – The date and time associated with the last value received from the target device. Please use Crimson 3.0+ Time and Date format option using a Data Type of addrLongAsLong. Timestamps are read-only and are dependent upon the variation supported in the target device.

Class – Data item used to assign the desired DNP3 class 0, 1, 2 or 3. Success of the assignment command may be determined by mapping to a read/write tag item. Upon success the entered value will remain, otherwise the value will revert to the previous value.

On Time – Write only attribute item used when setting the Binary Output control item.

Off Time – Write only attribute item used when setting the Binary Output control item.

Freeze – Write only bit mask item used to perform a Counter Freeze. Bit mask definition is as follows:

> Bit 0 – freeze counter
> Bit 1 – reset counter
> Bit 2 – no ACK required

> Note: No action will occur if bit 0 is not set or no change in the Freeze value has taken place.

Accessing 64-bit Values:

Access to 64-bit double values is possible by using data arrays in conjunction with user functions provided in Crimson 3.0+. Simply map all parameters of type double to a numeric tag array. The array selection is available in each tag.
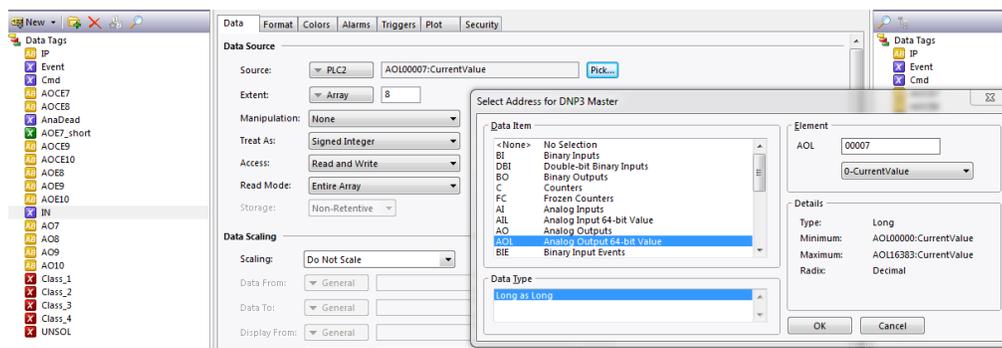
Then use the following user functions to get and set double values, respectively.

> cstring AsTextR64(Data)

Where Data is the first element in the array of the double value passed as a string.

> void   TextToR64(Input, Output)

Where Input is a string representing a double value and Output is the first element in the array of the double value to be set.

Note: Other 64-bit math functions are also available. Please review the Crimson 3.0 Reference Manual.

Enabling Events:

To enable events for a data item, assign a non-zero class to the data item. When using unsolicited messages (enabled via the Unsolicited Message Enable/Disable Mask command – see Command Access below) for the assigned class, events update when received. Otherwise, when using solicited messages events update on each communications scan or by pre-defined intervals when using the Selective Polling device option (refer to Serial Configuration or Ethernet Configuration section above).

Command Access

The following DNP3 commands are also available:

Sync Time
Cold Restart
Warm Restart
Unsolicited Message Enable Mask
Unsolicited Message Disable Mask

```
Select Address for DNP3 Master                                          ⌧

 ┌─ Data Item ──────────────────────────────┐   ┌─ Element ──────────────┐
 │                                           │   │  None     ┌──────────┐  │
 │  FCE   Frozen Counter Events         ▲    │   │           └──────────┘  │
 │  AIE   Analog Input Events                │   │                         │
 │  AIEL  Analog Input Event 64-bit Value    │   │           ┌──────────▼┐ │
 │  AOE   Analog Output Events               │   │           └───────────┘ │
 │  AOEL  Analog Output Event 64-bit Value   │   └─────────────────────────┘
 │  FB    Failed Cmd/Write Feedback          │   ┌─ Details ──────────────┐
 │  ST    Sync Time                     ≡    │   │                         │
 │  CR    Cold Restart                       │   │   Type:                 │
 │  WR    Warm Restart                       │   │   Minimum:              │
 │  UE    Unsolicited Msg Enable Mask        │   │   Maximum:              │
 │  UD    Unsolicited Msg Disable Mask  ▼    │   │                         │
 │                                           │   │   Radix:                │
 └───────────────────────────────────────────┘   │                         │
 ┌─ Data Type ──────────────────────────────┐   │                         │
 │                                      ▲    │   └─────────────────────────┘
 │                                           │    ┌────────┐   ┌────────┐
 │                                      ▼    │    │   OK   │   │ Cancel │
 └───────────────────────────────────────────┘    └────────┘   └────────┘
```

Using Commands:

All commands require a non-zero value change.

Unsolicited Message Enable/Disable Mask – Bit mask definition is as follows:

Bit 0 – Class 1
Bit 1 – Class 2
Bit 2 – Class 3

Error Feedback

Red Lion provides Failed Cmd/Write Feedback data items in that details are available to the user when an error occurs. Note the system will not automatically retry errors that provide feedback details.

Ten sets are available – each set containing the following details:

Object – The data item associated with the error. Please see object table below for numerical translation.

Point – The index or element associated with the error.

Flags – Bit mask representing error or condition. Please refer to Error Flags table below for bit definitions.

Timestamp – Time of the error feedback report. Please use Crimson 3.0+ Time and Date format option.

The example below demonstrates using arrays for feedback access.
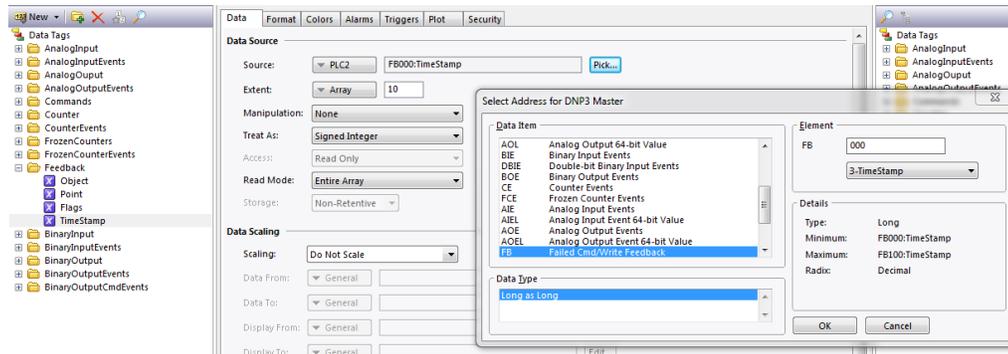
Error Flags

0	Unsupported Function
1	Object Unknown
2	Parameter Error
3	Buffer Overflow
4	Already Executing
5	Bad Configuration
7	n/a
8	All Stations
9	Class 1
10	Class 2
11	Class 3
12	Need Time
13	Local
14	Trouble

Revision History

07/26/16 – Created
12/02/16 – Updated Data Access notes.
12/22/16 – Updated General Information.
07/19/18 – Updated to new format.