



ControlLogix Ethernet Driver Notes

KepserverEx V4.63.192-U

02/28/2002

Introduction

The ControlLogix system offers a superior approach to multiple types of controls. You can perform sequential, process, drive or motion control, in any combination, with this single system. The driver supports the Allen-Bradley Logix5550/5555 Controller and requires a ControlLogix 1756-ENET module for Ethernet communications. Other supportable features of this driver will be described in greater detail throughout this document.

Optimization

With any Programmable Controller there are unique ways for optimizing system throughput, and ControlLogix is no different from the rest. The ControlLogix has a variety of ways to enhance the overall performance and system communication. Due to the complexity of ControlLogix, this document will not cover them all, but it will lay the foundation to start you off on the right path.

1. **System Overhead Time Slice (SOTS):** This is set in the RSLogix5000 programming software. This percentage represents the amount of time that is allocated to the processor to perform communications tasks. 100% - SOTS is the percentage of time for controller tasks (i.e. ladder logic). The default SOTS setting for CPU communications is set at 10%. This means that for every 10ms program scan that occurs, the controller spends 1ms processing requests. Increasing or decreasing the SOTS percentage depends on the priority of your operation. If controller tasks are of priority (i.e. ladder logic) then the SOTS setting should be below 50%, but if communications are the key, then the SOTS setting should be above 50%. For well balanced CPU utilization and communications we recommend setting the SOTS between 30% - 60%.
2. **ControlLogix Multi-Item Request Packets:** This is offered in the ControlLogix system to provide the means of adding multiple tag names into one request with the exception of array and string tags. The Multi-Item Request Packets are about 500 bytes in size, and every character in a tag name takes up about 1 byte. This provides drastic improvement in performance over single tag transactions. The only limitation is the packet size itself, and the key is to use the shortest possible tag names. The smaller the tag name, the more tags you will be able to fit in a single transaction, and this is the key to maximize the Multi-Item Request Packet feature.
3. **Array Elements Blocked:** Reading of base data type array elements is optimized. This is done by reading a block of the array in a single request as opposed to reading each element individually. The more elements read in a block, the greater the performance. Since transaction overhead and processing consumes the most time, it is optimal to do as few transactions as possible while scanning as many desired tags as possible. This is the essence of array element blocking. Block sizes are specified as an element count. A block size of 120

elements means that a maximum of 120 array elements will be read in one request. The maximum block size is 3840 elements. Boolean arrays are treated a little different. In protocol, a Boolean array is a 32-bit array. By requesting element 0, you're requesting bits 0 through 31. To maintain consistency in discussion, a Boolean array element will be considered a single bit. In summary, the maximum number of array elements (based on block size of 3840) that can be requested is: 122880 BOOL, 3840 SINT, 3840 INT, 3840 DINT, and 3840 REAL.

ControlLogix Driver

The ControlLogix driver has been developed to support more than just ControlLogix processors, but to support a wide area of device functionality. These areas range from gateway support of different Allen Bradley proprietary networks (i.e. Data Highway Plus, ControlNet) to the use of an Ethernet Interface (ENI), which provides EtherNet/IP connectivity to all Allen Bradley DF1 (Serial RS-232) full duplex devices. This appnote will go into great detail the process of configuring these options.

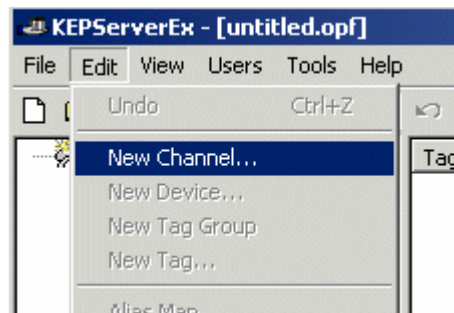
Creating a ControlLogix Project

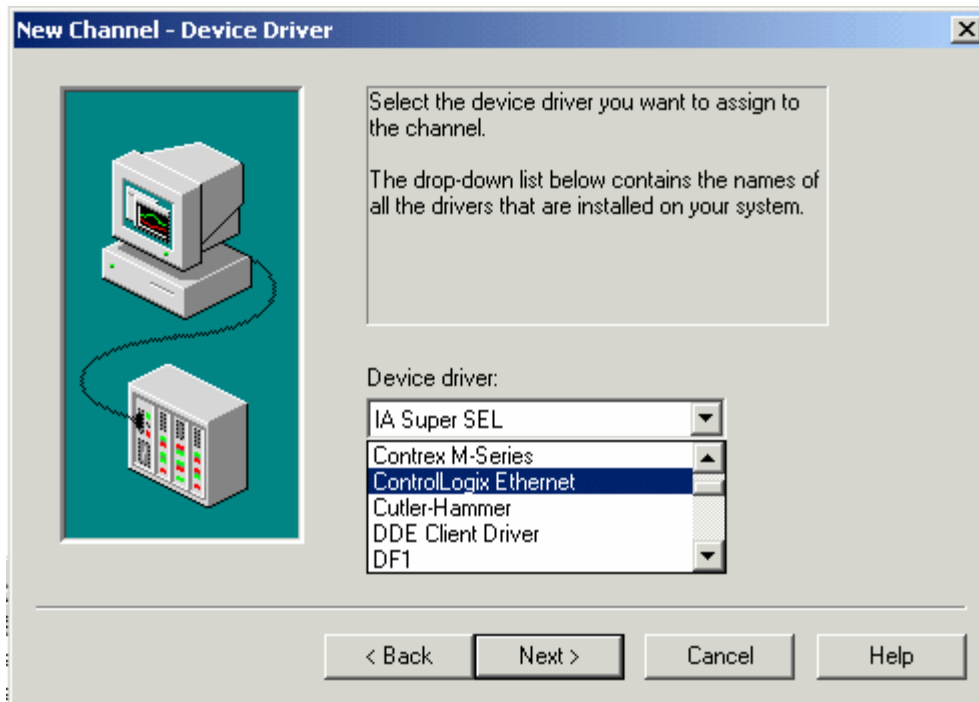
Creating a project in KEPServerEX is a simple process if you can understand the basic structure. That structure is broken down into three parts: Channels, Devices, and Items. The Channel is where you would select the actually mode of communication, in this case it would be the ControlLogix driver itself. Next you need to configure the device. This is where it can get tricky, if you're not quite sure what to do. Configuring the device will prompt you to select what mode you what the ControlLogix driver to utilize. As previously stated above, the mode you select is contingent on the needs of your operation. Finally you need to create items which the driver and server utilize to locate and access data. These items can be user defined tags in the KEPServerEX, front-end client defined tags, or by using the Automatic Tag Generator. The Automatic Tag Generator imports an .L5K file from RS Logix5000, the Rockwell programming software for ControlLogix.

Creating a Channel

The following steps will explain how to configure a channel with the ControlLogix driver.

With KEPServerEX open select edit: new channel. The new channel wizard will appear. Create a name and click next.



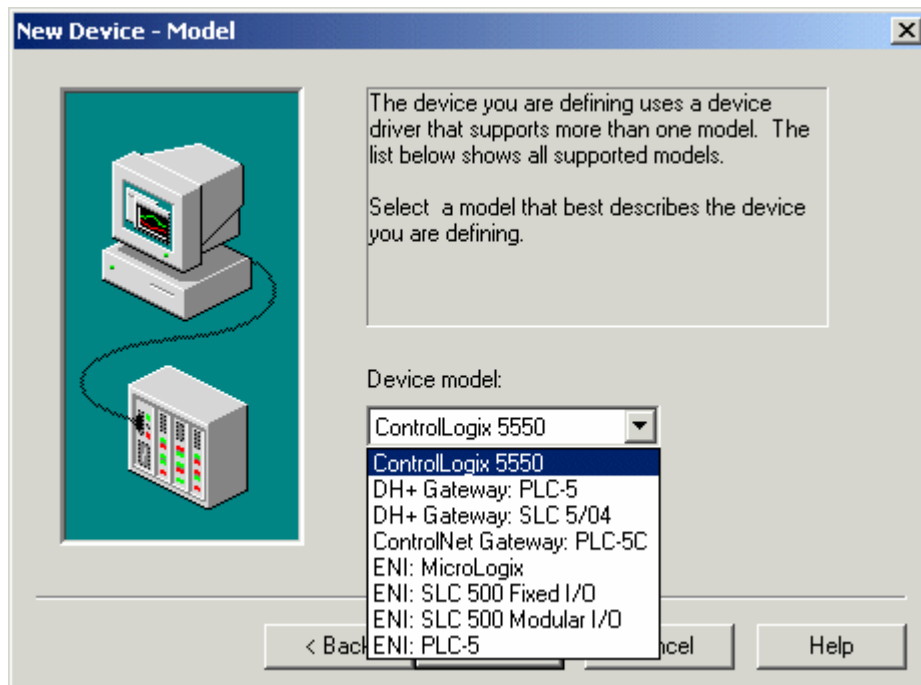


Select the ControlLogix Ethernet driver and click next. Next select your network adapter, and then configure your write optimizations (Defaults will work fine). The last window in the channel setup process lists all the information that was entered during the setup process. If the information is correct, press Finish and continue to the device setup stage

Creating a Device

Creating a device is where you need to know exactly what mode you plan on using in the ControlLogix driver.

Add a new device from the edit menu, create a name for it, and click next.

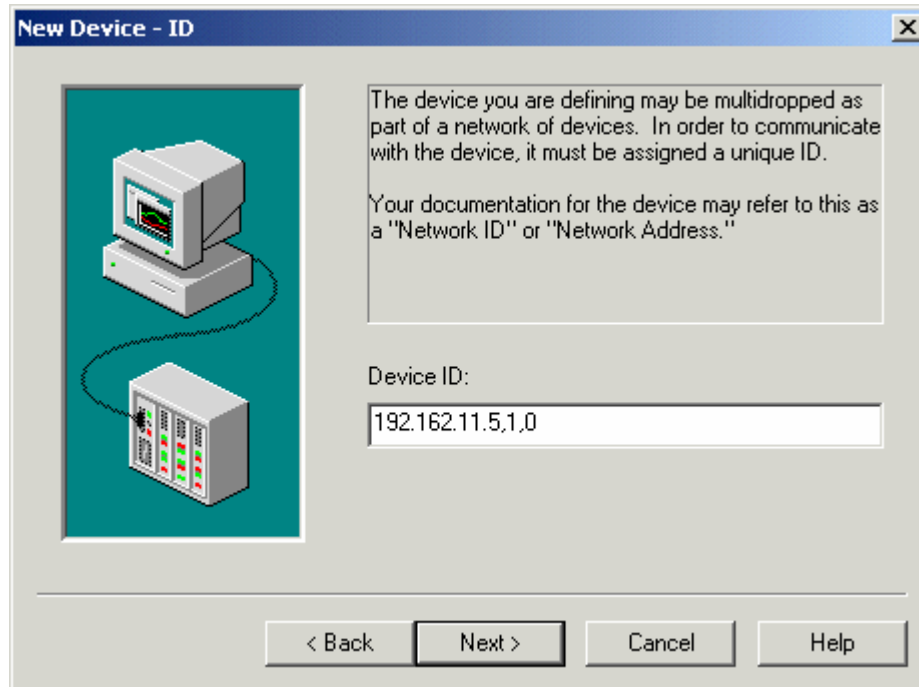


The New Device – Model page is where you need to select the model.

Selecting the ControlLogix 5550 will enable communications to the PLC processor only. You will be able to utilize any I/O modules on the ControlLogix rack.

The DH+ Gateway (PLC-5/SLC 5/04) and ControlNet Gateway (PLC- 5C) will use either the 1756-DHRIO Interface (DH+) or the 1756-CNB Interface (ControlNet) modules, both in conjunction with the 1756-ENET Ethernet module. Selecting any of these options will enable you to utilize the ControlLogix gateway feature to access devices on their respective network.

Finally the ENI: **Micrologix, SLC 500 Fixed I/O, SLC 500 Modular I/O, and PLC-5** use the 1761-NET-ENI terminal server. This will enable any of these serial devices to communicate on an Ethernet network. The protocol used is Ethernet/IP.



Configuring the Device ID is different for each of the models selected on the previous Device Model page.

ControlLogix: The device ID is used to specify the device IP address along with the slot number the controller CPU resides in.

Device IDs are specified as: IP Address>, <Port ID>, <Link Address>

<i>Designator</i>	<i>Description</i>	<i>FormatsValid Values</i>
IP Address	1756-ENET IP Address	Decimal 0 - 255
Port ID	Specifies a way out of the 1756-ENET Interface module and must equal 1 (port to the back plane).	Decimal 1
Link Address	Slot Number of the ControlLogix processor	Decimal 0 - 255

Example: 192.162.11.5,1,0. This equates to 1756-ENET IP of 192.162.11.5 and CPU resides in slot 0.

DH+ / ControlNet Gateways: The device ID is used to specify the device IP address along with the DH+ parameters necessary for making a connection.

Device IDs are specified as: <IP Address>, <Port ID>, <Link Address>. <DH+ / ControlNet Channel>.<DH+ / ControlNet Node Address>

<i>Designator</i>	<i>Description</i>	<i>Formats Valid Values</i>
IP Address	1756-ENET IP Address	Decimal 0 - 255
Port ID	Specifies a way out of the 1756-ENET Interface module and must equal 1 (port to the back plane).	Decimal 1
Link Address	Slot Number of the 1756-DHRIO/1756-CNB Interface module. Decimal 0 - 255	
Channel	DH+/ControlNet Channel to use	Alpha A and B
Node	DH+/ControlNet Node Id of target PLC	Decimal 0 - 99

Example: 192.162.11.5,1,2.A.3 This equates to 1756-ENET IP of 192.162.11.5, DH+/ControlNet card resides in slot 2, use DH+/ControlNet Channel A, and addressing target DH+ Node Id 3.

ENI Module: The device ID is used to specify the IP address of the 1761-NET-ENI. Device IDs are specified as: <IP Address>

ENI Device ID

1761-NET-ENI

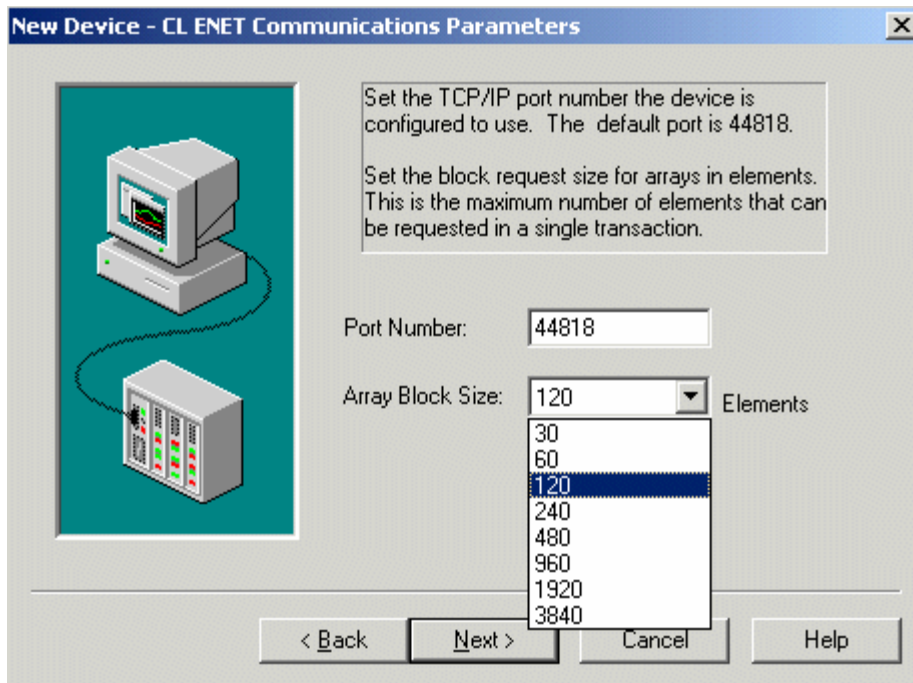
The device ID is used to specify the IP address of the 1761-NET-ENI. Device IDs are specified as:

<IP Address>

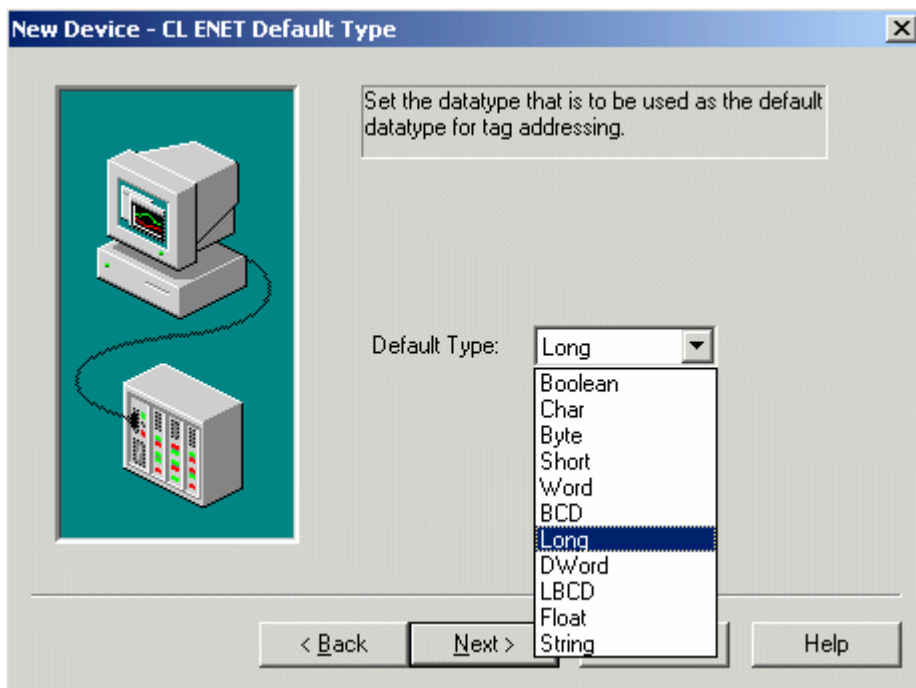
<i>Designator</i>	<i>Description Formats</i>	<i>Valid Values</i>
IP Address	1761-NET-ENI IP Address	Decimal 0 - 255

Example: 192.162.11.5 This equates to an ENI IP of 192.162.11.5. Since the device supports only Full Duplex DF1, no node id is required.

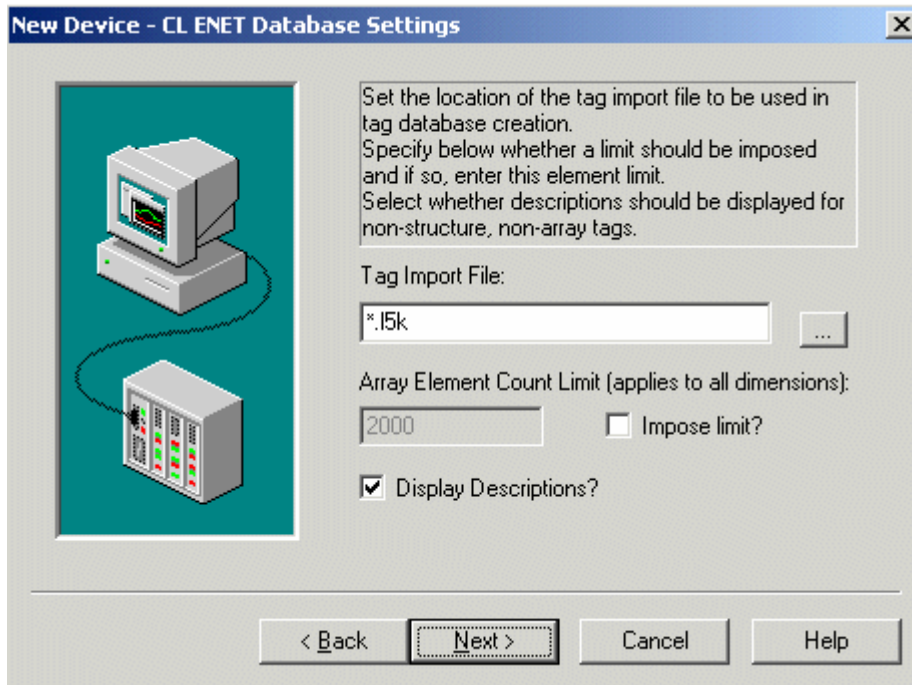
Once this step is complete, you will need to configure your communications parameters, and decide whether or not you will use the Tag Database Generator.



The CL-ENET Communications Parameters page is next. The default TCP/IP port that the device is set to is 44818. Also on this page is where you set the Array Block size, which was previously discussed in the optimization section of this appnote.

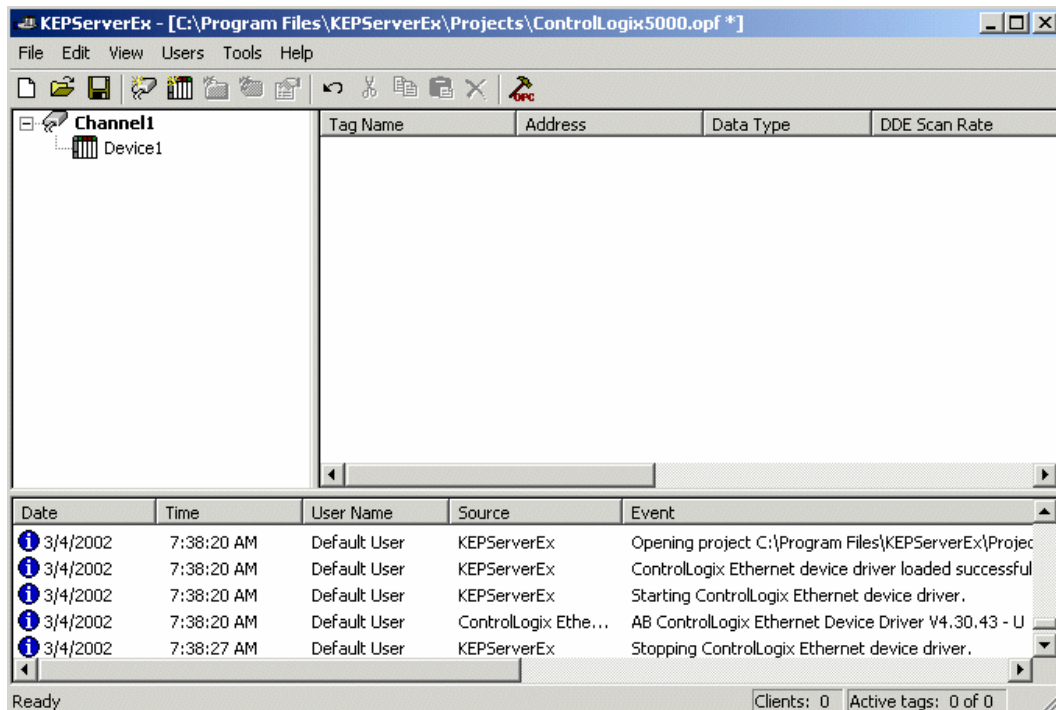


This step is important. The default data type is what KEPServerEX resorts to when it cannot recognize or define the tag data type during a database import. (i.e. import of any .L5K or .CSV files). Keep in mind KEPServerEX does not resolve the data type on non-bit words within Inputs/Outputs. This means if you do not specify an Input/Output to the bit level it will not carry over the data type created in your project. In this case it will revert to the default data type selected on this page.

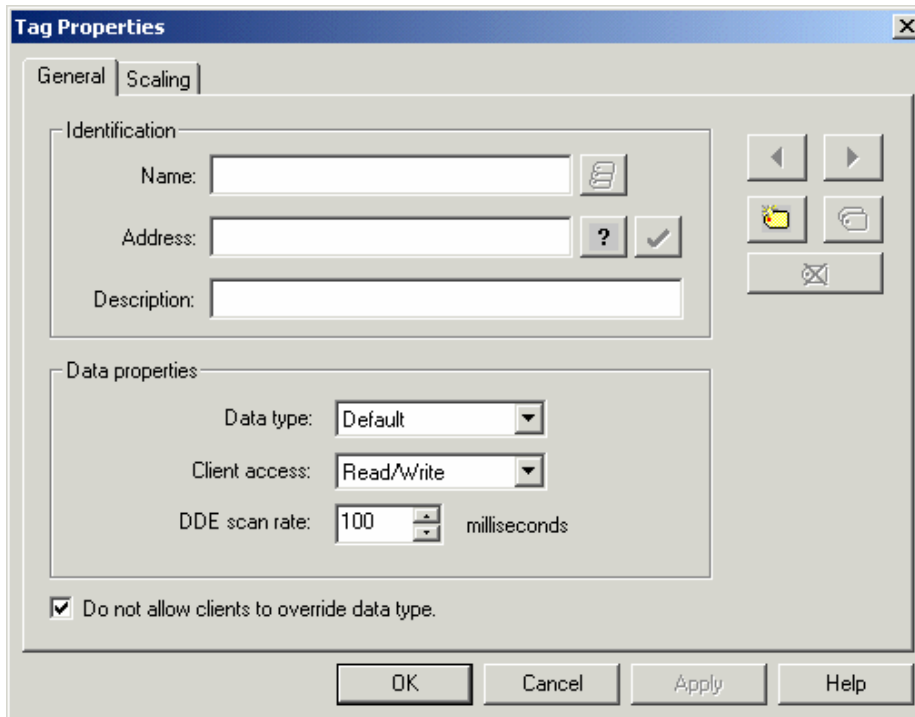


As previously stated, you can import an .L5K file to be used in the tag database creation. This page will ask you to specify the location of your particular file.

The last device setup screen, much like the final channel setup screen, lists the configurations for the device, based on the information entered in the previous screens. If this is all correct, press finish. You should then have a window like this.



At this point, you can add whatever tags you wish.



Help in tag addressing is available by clicking the question mark button. The server will prompt you if you attempt to configure an unsupported tag address.

More detailed information on general channel/device/tag setup and specific ControlLogix setup is available in the KepserverEX and ControlLogix help files provided with the server.