

LINKnet TechBox



**Product
Manual**
HA473865U001
Issue 6

Safety Information



Please read this information BEFORE installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial motor speed control using DC or AC motor controllers, with DC motors AC induction or AC synchronous machines.

Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

IMPORTANT

It is required that the user be familiar with navigating through the drive MMI menus, be able to select functions and set values and options. For further reading on this topic, refer to the appropriate drive instruction manual. If using DSE890 or DSElite it is required the user must be familiar with the software packages.

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Product Features

- Available for AC690+ and DC590+ products
- Compact 5H x 3W x 1D inches
- Easy snap on installation
- Eliminates hard wired signal connections
- Standalone processing with built in macros
- Indicator LED's for Drive and power On status
- Direct tag access for all drive parameters

Part Number and Identification

The Part numbers are:

- DC590+ Drive
Enclosed in a "Technology Box" for use with the 590+ all Frames: **6055-LNET-00**
- AC690+ Drive
Enclosed in a "Technology Box" for use with the 690+ Size B: **6053-LNET-00**
Enclosed in a "Technology Box" for use with the 690+ Sizes C+: **6055-LNET-00**

Ethernet Protocols supported:

LINKnet supports the following Ethernet protocols:

1. Modbus UDP/IP Master - Supports Remote IO, Input / Output support.
2. Modbus TCP/IP Slave or EtherNet IP Server (slave). Supports implicit (Class 1) for data access.

LINKnet acts as a slave device only.

Only 1 Slave protocol can be supported per LINKnet card.

Supports TS8000 HMI Touchscreen and PLCs.

EtherNet IP Server (slave) is supported in LINKnet firmware version 1.5 or greater and DSE v 3.06 or greater.

Supports up to 500 bytes of input data and 500 bytes of output data, using any combination of 16 bit (2 bytes) registers and 32 bit (4 bytes) registers.

Supports up to 250, 16 bit input registers & 250, 16 bit output registers

Supports up to 125, 32 bit input registers & 125, 32 bit output registers

Note: Up to 3 active Modbus TCP/IP connections are supported per LINKnet module, multiple Masters may work but it will require more overhead. (Supported in firmware version 1.6 or greater only)

Software Requirements:

The software DSE (Drive System Explorer) & DSELite version 3.06 or greater supports LINKnet. It is always recommended to obtain the latest version of DSE by doing a **HELP / CHECK FOR UPDATES**.

Hardware supported:

1. The 690+ drive with firmware version 5.x
2. The 590+ drive with firmware version 8.10 or greater only. The drive can be flashed to the latest firmware version by using DSELite.
3. The 590+ drives with firmware version 5.x and 7.x drives. The LINKnet firmware must be version LN 1.6 or greater.

Ethernet recommendations:

The PLC should be set up for Point To Point (Unicast) connection instead of Multicast connection. If Multicast is used, a managed switch is recommended / required.

The LINKnet module should be in a LAN / VLAN with only other equipment associated with its operation. Broadcast traffic on the LAN / VLAN should be kept to a minimum.

Web page:

LINKnet does not support a webpage.

Chapter 2 - Installation

Installing the Option

WARNING

Before installing, ensure that the drive power is switched off and cannot be switched on accidentally by other personnel.

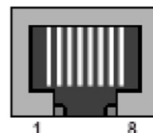
Wait 5 minutes after disconnecting power before working on any part of the system or removing the covers from the drive.

Wiring Requirements:

Use only Cat 6 Shielded Ethernet, patch or crossover cable.

Cable Connections

PIN	Signal
1	TD+
2	TD-
3	RD+
4	Termination
5	Termination
6	RD-
7	Termination
8	Termination



Cable Specifications – patch or crossover

Cable Type	Maximum Node-to-Node Distance (m)
CAT6 Shielded	100

LINKnet operates at the nominal rate of 100 Mbit/s.

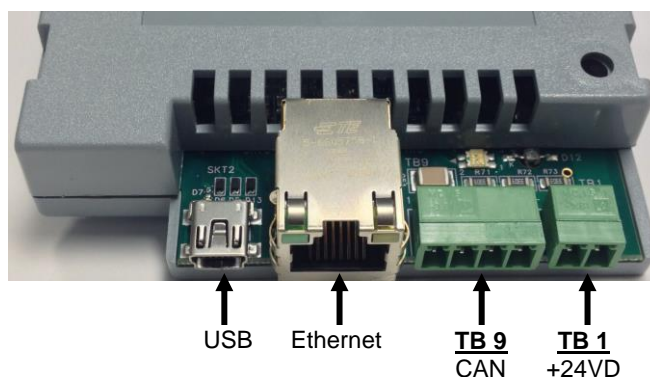


Figure 4 - LINKnet Techbox Connections

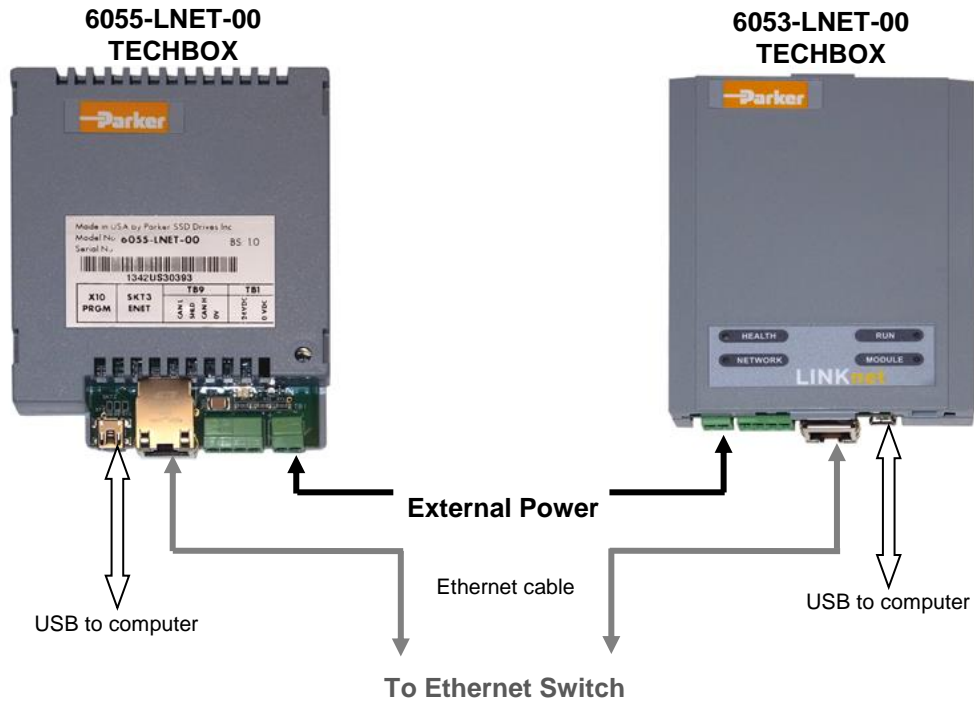


Figure 5 -Sample LINKnet Network

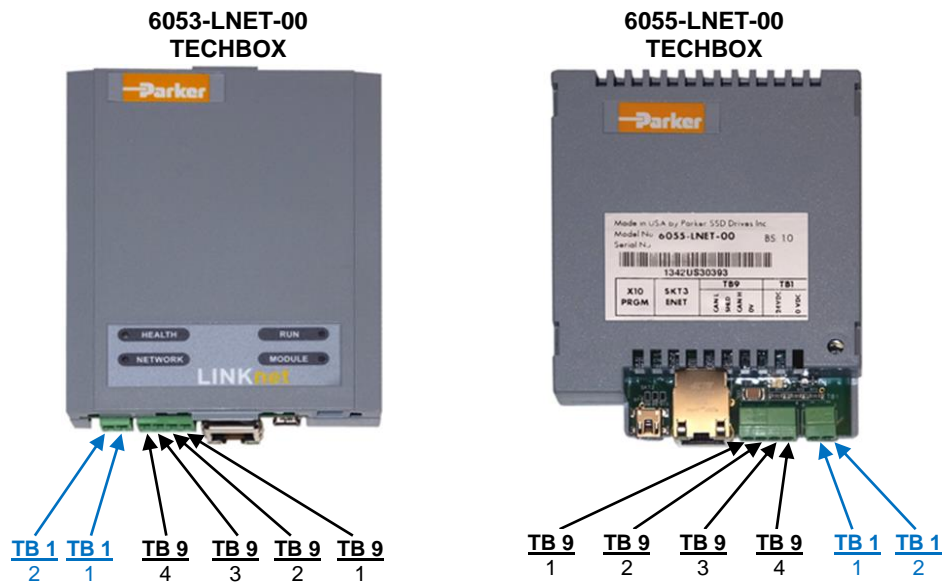


Figure 6 - LINKnet Terminations

24VDC External Power Terminal block

Techbox TB 1	PIN 1	PIN 2
6053-LNET-00	+24VDC	0V
6055-LNET-00	+24VDC	0V

(The +24V terminal is always on the inboard terminal)

Ethernet Connection – (RJ45)

The Ethernet port is primarily intended for peer to peer communications with other modules in the system. Other functions include direct support between the LINKnet module and a PC, ModBus TCP/UDP access to remote I/O, HMI's and PLCs. A computer connected to the Ethernet connector on the LINKnet module or via an Ethernet switch, can be used to install LINKnet configurations or monitor (Go On line) with any element within the LINKnet network. SSD Drives graphic configuration software package Drive System Explorer 890 (DSE890) version 3.03 and all subsequent versions support LINKnet. If you have an older version, updates may be obtained simply by doing a HELP / CHECK FOR UPDATES within DSE or by contacting Parker SSD Drives Product Support.

Starting with firmware version 1.6, firmware can be installed via over Ethernet or the USB port. Firmware version 1.5 or less, cannot be installed into a LINKnet module over Ethernet. The USB port must be used.

USB Computer Connection – USB mini B connector.

A computer connected to the USB socket on a LINKnet module can be used to install configurations, install firmware or monitor (Go On line) with a LINKnet Techbox. The USB cable can also supply power to the individual LINKnet module. The connector is a USB mini B socket. A USB cable is supplied with the DSE890 software package. The connected LINKnet Techbox can also forward (act as a gateway for) commands to other LINKnet Techbox connected via Ethernet. When using DSE the entire LINKnet network can be viewed using this connection. Since the USB cable can supply power to the LINKnet Techbox, a Powered USB Hub may be required, as some PC's may not have enough power on the USB port, to properly power the Techbox. If the USB cable is connected to the LnTB and it does not have the required amount of power to power the Techbox, the *Module Status LED* will flash in the *Power Fail* mode and communications will not be established.

If using this method to communicate to the LINKnet Techbox, the USB cable **MUST** be connected to the Techbox first, then launch DSE. If DSE is launched first and then you connect the USB cable to the Techbox, communications will not be established. (The USB driver does not get loaded into Windows until the USB cable is connected to the Techbox. Once this driver is loaded into Windows, DSE can detect it. DSE can only detect drivers, if it is closed.)

DSE must always be closed before connecting the USB cable to the Techbox.

External Power Connection (Optional) Terminal Block (TB 1)

The LINKnet Techbox incorporates a switch mode power supply. When the LINKnet Techbox is fitted to the 590+ or 690+ drive, the power will be supplied from the drive. If power is supplied externally from the Terminal Block TB1 connector, the Techbox will be powered from this external supply and not the drive.

Note: If the Techbox is fitted to a 590+ or 690+ drive do not supply an External 24 VDC. The drive and the Techbox MUST power up together in order to synchronize the 2 devices. If the Techbox powers up before the drive, the parameters in the Techbox and in the drive may not be synchronized and the drive may not respond as expected.

The External Power Connection is to be used only when the Techbox does not have a drive configuration in it or it is used as a standalone device.

Note: Power requirements: 200ma @24Vdc with a 15 to 30Vdc range. 320 mA @ 15 Vdc and 160 mA @ 30Vdc.

24VDC External Power Terminal block – 2 pin connector (TB 1)

The plug-in connectors for TB1 are physically different for the 6055-LNET-00 TechBox, and the 6053-LNET-00 TechBox.

6053-LNET-00	+24VDC	0V
6055-LNET-00	+24VDC	0V

(The +24V terminal is always on the inboard terminal)

CAN peer-to-peer Terminal block – 4 pin connector (TB 9)

This option is not implemented yet

The Can port will support peer to peer communication of run time data between LINKnet Techboxes.

Techbox TB 9	PIN 1	PIN 2	PIN 3	PIN 4
6053-LNET-00	CAN L	SHLD	CAN H	0V
6055-LNET-00	CAN L	SHLD	CAN H	0V

(The CAN L (pin 1) terminal is always on the inboard terminal)

Fitting the TechBox to the frame B AC690+ Drives

WARNING!

Ensure that all power is off prior to working on the drive

The option is supplied as a “6053-LNET-00 Technology Box” which fits into the front of the AC690+ drive in place of the keypad or blank cover.

- Remove the terminal cover and screws.
- Plug the ribbon cable into the back of the TechBox and into the socket on the AC690+B drive
- Snap the TechBox into place in the recess on the front of the AC690+B
- Make all user-wiring connections. Connect all shields to the ground post on the chassis. Make a connection from the TechBox TB1 ground terminal to the ground post on the chassis.
- Re-install the terminal cover securely with the screws.

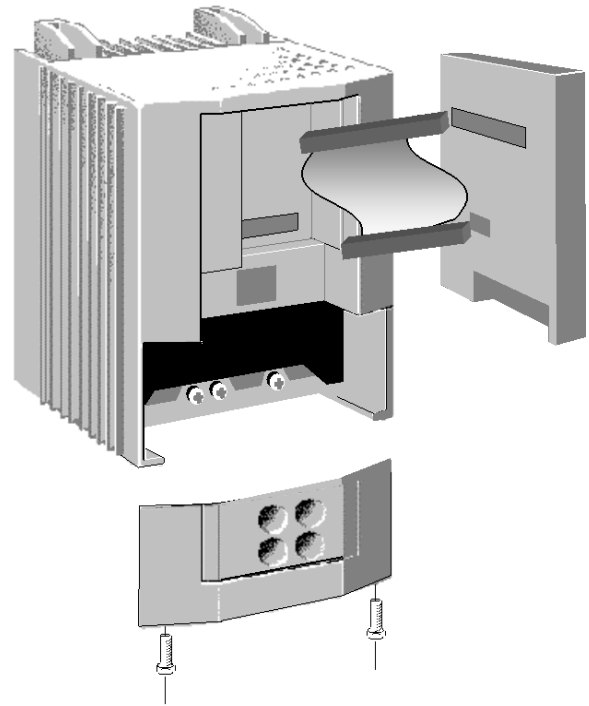


Figure 7 – 6053 LINKnet Installation

Note: If permanently using the keypad with the Technology Box fitted, mount the keypad remotely using the Panel Mounting Kit with part number (6052). The connecting lead enters the AC690+ drive through the gland plate.

Fitting the TechBox to a DC590+ and AC690+ frames C and above

The option is supplied as a “6055-LNET-00 TechBox” which fits into the lower right front of the DC590+ and the AC690+C - K drive.

Note: The 6055-LNET-00 TechBox does not affect the operation of the 6051/6901 keypad.

WARNING!

Ensure that all power is off prior to working on the drive.

- Remove the terminal cover.
- Plug the techbox into the socket located in the lower right side of the DC590+ and AC690+ C-K drive.
- Tighten the screw to secure the techbox to the drive. This also serves as a ground connection for the TechBox.
- Make all user-wiring connections. Connect all shields to the ground post on the chassis.
- Re-install the terminal cover securely with the screws.

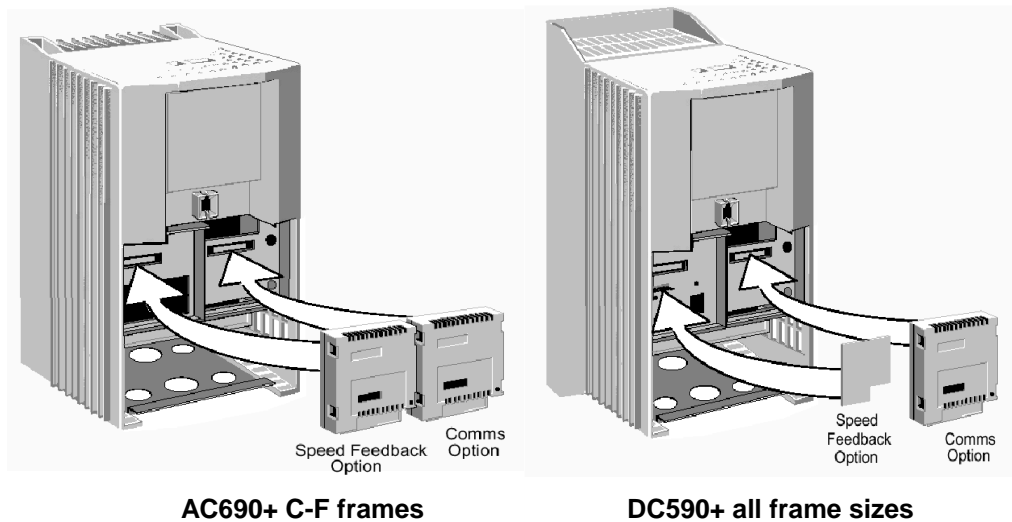


Figure 8 – 6055 LINKnet Installation

Chapter 3 - Initial Set-up

There are 2 ways to communicate to the LINKnet Techbox: USB & Ethernet

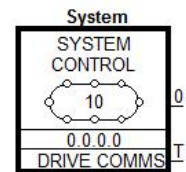
The USB port is primarily intended to use for initial set up of the Techbox and setting up of the IP address. But it can be used to install configurations, install firmware and monitor the entire LINKnet System. All of the nodes in the system will appear in the DSE Module List when using the USB. Also if there are Ethernet issues or IP address conflicts, the USB port can be used to directly connect to each Techbox for analysis. When using the USB for the first time, the USB driver must be installed. Refer to *Installing the USB driver for DSE and the LINKnet Techbox* at the end of this section.

An Ethernet connection can also be used to connect to the LINKnet Techbox. It will have a faster connection than the USB method. A pc can be connected directly to the Ethernet port or it can be connected to the Ethernet switch where all of the modules in the system will appear in the DSE Module List. When communicating to the LINKnet modules via Ethernet, the computer must be on the same subnet as the LINKnet modules. For set up instructions on using Ethernet communications, see page 15 or in DSE go to *HELP / LINKnet Support / Setting the computer IP Address for LINKnet access*.

IP addressing information

Each LINKnet Techbox must have a unique IP address. Each LINKnet Techbox has a unique default IP shipping address of 192.168.1.xxx. The last 3 digits will be random for each Techbox in the range of 1 - 127.

When the LINKnet TB is powered up in a system and it has the default shipping configuration, it will *self-assign* a unique address on each Techbox as described above, with a subnet Mask of 255.255.254.0



At this point DSE can be launched and all of the LINKnet Techboxes will appear in the Module List.

In a LINKnet configuration there is a System Control block which contains a place to set the IP address. If no IP address is entered, the default shipping address of 192.168.1.xxx will be used and the TB will be *self-assigned* an IP address in the range of 192.168.1 and the last octave will be in the range of 127 – 1. Counting down.

If an IP Address is entered in the System Control block, it will override the *self-assigned* IP address. (if possible)

If there is a duplicate IP Address, the LINKnet will *self-assign* the modules in the range of 192.168.1 and the last octave will be in the range of 128 to 199.

It is recommended that an IP Address be assigned to each LINKnet TB. It is recommended that the LINKnet configuration address be used as the last 3 digits of the IP address. Thus if the configuration address is 10 the IP address would be 192.168.1.10

When using 3rd party Remote I/O and PLC's, it is recommended to use an IP Address in the range of .200 to .254 All nodes must be on the same subnet mask.

Summary of IP address's for 192.168.1.xxx

where xxx = 1 – 127. *Self-assigned* by LINKnet and assigned by the user.

where xxx = 128 – 199. *Self-assigned* by LINKnet if there are duplicate address.

where xxx = 200 – 254. Recommended IP Address' when using 3rd party Remote I/O and PLC's,

Configuring the LINKnet Techbox IP addressing

There are two ways to set the IP Address. One way is using the SYSTEM CONTROL function block, which is located in the LINKnet configuration, as shown below. If you enter an IP Address you **MUST** also enter the Subnet Mask address. If the IP Address in the SYSTEM CONTROL block is left at 0.0.0.0, the IP Address which is currently in the Techbox will be used. If an IP Address is set in the SYSTEM CONTROL block, it will override the present IP Address which is in the Techbox.

The remaining way is to use the USB cable and connect it directly to the individual TechBox via the USB port on the Techbox. The USB cable will supply power to the Techbox so it does not have to be fitted to a drive. To use this method, connect the USB cable to the LINKnet Techbox, then launch DSE and go to **COMMAND / REFRESH FULL**. The module will appear in the **MODULE LIST**. Then do a **COMMAND / SET IP ADDRESS**. Enter the desired IP ADDRESS. Then do a **COMMAND / GET INFO** and verify this data in the **SCRATCHPAD**. Because of the way the USB driver loads and unloads from Windows, there is a specific procedure which must be followed. Connect the USB cable to the Techbox first then launch DSE. DSE cannot be open when connecting the USB cable to the Techbox. The USB driver will not load, thus the module will not appear in the **MODULE LIST**. Thus if you are setting the IP ADDRESS on multiple Techboxes, after removing the USB cable from the Techbox, DSE must be closed. Then connect the USB cable to the next Techbox, then launch DSE and repeat the procedure.

The IP address of the Techbox will be set as long as there is no IP address entered in the *System Control* block. It must have an address of 0.0.0.0

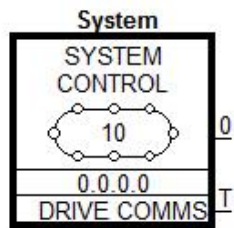
If there is an IP address entered in the *System Control* block it will get over ridden with the set entered address.

Setting the Node Address

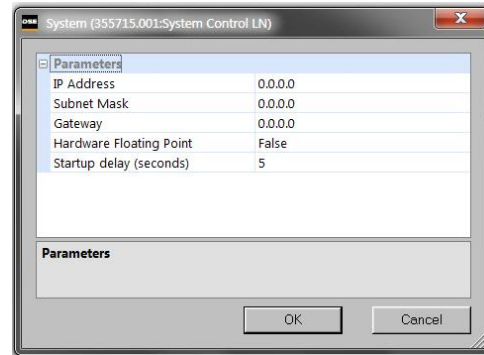
Up to 127 LINKnet nodes can be addressed in the LINKnet configuration. Thus, the **NODE ADDRESS** range is 1 – 127.

To set the *Node Address* go to **EDIT / Net Address** and set the Node Address. The Node Address in the example shown below is address 10.

There is no limitation on the IP address, but they all **MUST** be on the same subnet.

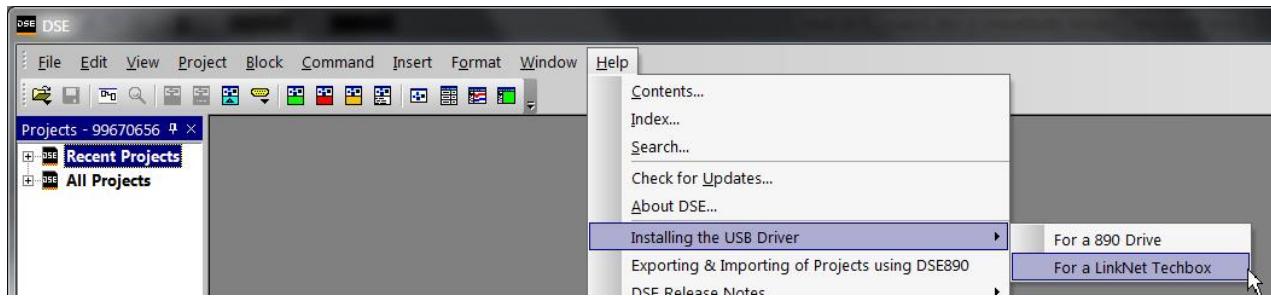


The **SYSTEM CONTROL** block is located in the LINKnet configuration.



Installing the USB driver for DSE and the LINKnet Techbox

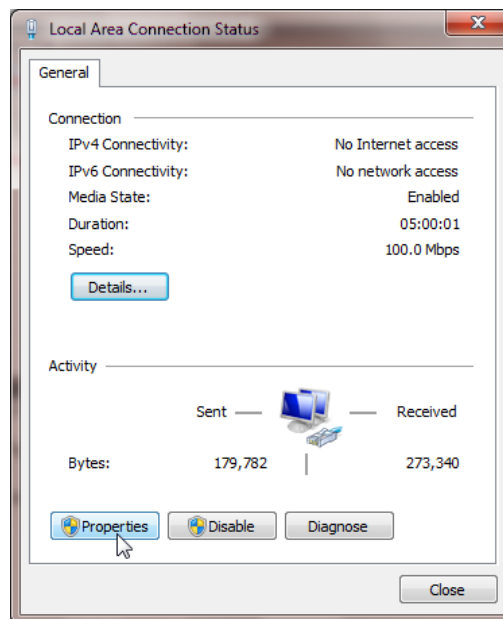
When using the LINKnet Techbox for the first time, the USB **STMicroelectronics Virtual COM driver** must be installed, so DSE can communicate to the LINKnet Techbox. To do this launch DSE, go to the menu on the top, called **Help / Installing the USB Driver / For a LINKnet Techbox**. View this document and follow the instructions.



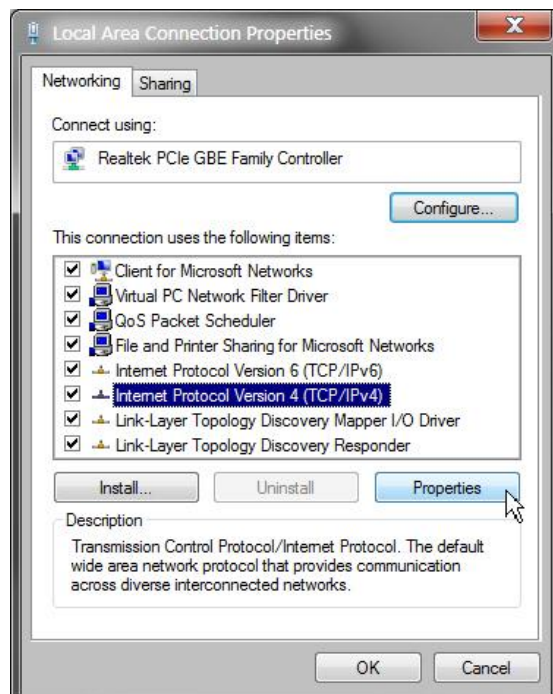
Setting the computer IP Address for LINKnet access via Ethernet

When communicating to the LINKnet via Ethernet, the computer must be on the same subnet. To change the pc settings:

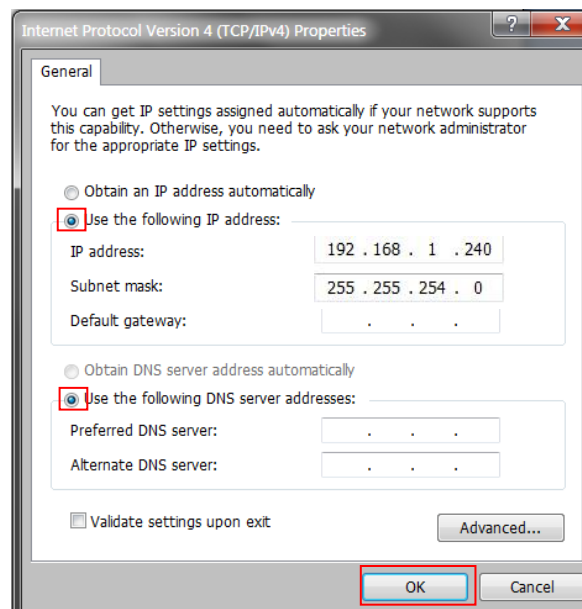
1. From the START menu, open the Control Panel and select “Network and Sharing Center” or “Network Connections” depending on the version of Windows you’re running.
2. In the window that comes up, click on “**Local Area Connection**”. That should bring up a dialog that looks something like the following:



3. Click on the **Properties** button to bring up the Local Area Connection Properties dialog. On Windows 7 it should look something like this (it will be slightly different for XP):



4. As shown above the **Local Area Connection Properties** dialog will appear. Highlight the “**Internet Protocol Version 4 (TCP/IPv4)**” (“Internet Protocol TCP/IP” in XP), then click on the **Properties** box and that should bring up the Internet Protocol Dialog that should look something like:



5. Click on the selection “**Use the following IP address**” and enter 192.168.1.240 for the IP address and 255.255.254.0 for the Subnet mask. Make sure “**Use the following DNS server addresses**” is also selected, but you don’t have to enter anything for that. Click **OK**. (For the IP address the last octet should be any number over 200).

Configuring the Drive

MMI Menu Map

- 1 **SETUP PARAMETERS**
- 2 **FUNCTION BLOCKS**
- 3 **SERIAL LINKS**
- 4 **TEC OPTION**
 - TEC OPTION TYPE
 - TEC OPTION IN 1
 - TEC OPTION IN 2
 - TEC OPTION IN 3
 - TEC OPTION IN 4
 - TEC OPTION IN 5
 - TEC OPTION FAULT
 - TEC OPTION VER
 - TEC OPTION OUT 1
 - TEC OPTION OUT 2

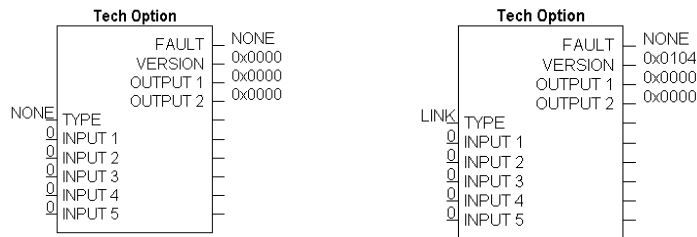
The first step in using the technology option is configuring the drive to accept the TechBox. The keypad (MMI), DSE890 (SSD Drives' device level configuration software), must be used to configure the TEC OPTION function block parameters inside the drive before commissioning the *LINKnet* technology option.

The parameter names/functions in this function block are inter-dependent and will change with different parameter values and various technology options.

The Function Block diagram below shows the DSE890 parameter names, which are also displayed on the MMI if no Option is fitted or an incorrect TYPE is selected for the fitted Option.

IMPORTANT

The user must be familiar with navigating through the drive MMI menus, be able to select functions and set values and options. For further reading on this topic, refer to the appropriate drive instruction manual. If using DSE890, the user must be familiar with the software package



Under TYPE, select LINK

Parameter Descriptions

TYPE

Selects the type of TechBox.

Range: Enumerated - see below

Enumerated Value : Technology Option

- 0 : NONE
- 1 : RS485
- 2 : PROFIBUS DP
- 3 : LINK
- 4 : DEVICENET
- 5 : CANOPEN
- 6 : LONWORKS
- 7 : TYPE 7

FAULT*Range: Enumerated - see below*

The fault state of the Technology Option card.

Enumerated Value : Fault State

- 0 : NONE: Normal operating mode.
- 1 : PARAMETER: Confirm that tag exists in the *LINK* Configuration.
- 2 : TYPE MISMATCH: Confirm that type of tag is valid.
- 3 : SELF TEST: The self test has failed. Replace TechCard/TechBox.
- 4 : HARDWARE: Hardware error. Replace TechCard/TechBox.
- 5 : MISSING: TechCard/TechBox not installed/

VERSION*Range: 0000 to FFFF*

The version of the Technology Option. If no option is fitted then the version is set to zero.

INPUTS (1–5)*Range: 0000 to FFFF*

Not used with the *LINK* Technology Option

OUTPUTS (1–2)*Range: 0 to 9999*

Not used with the *LINK* Technology Option

Other Function blocks

While configuring the “TEC OPTION”, you may also insert other Link function blocks into the TechBox template. This can be done by using DSE890.

DSE890

When configuring the “TEC OPTION” function block using DSE890 the TechBox and drive can be programmed completely using the DSE890 software. Drive System Explorer (DSE890) provides the TechBox templates for the DC590+ and AC690+ drives.

Powering up the LINKnet modules

To make sure that the LINKnet modules get initialized and get added to the Ethernet network, the Ethernet cable must be connected to the LINKnet module first and then apply power to it. There is an Ethernet hardware initialization which occurs and it only occurs 1 time, but the Ethernet cable must be fitted to the LINKnet module for this to occur. Also, the Ethernet cable **must** be connected to an Ethernet switch and this switch should be powered up first, before the drive.

LINKnet modules can be added to the Ethernet network at any time, as long as when they are powered up, the Ethernet cable is connected to the module and to an active Ethernet switch.

If the Ethernet cable is disconnected from the LINKnet module, then power is applied and then the Ethernet cable is connected to the LINKnet module, it will not get initialized and it will not get added to the Ethernet network.

In the *System Control* block, there is a parameter called *Startup delay*. By default, this parameter is set to 5 seconds. After power is applied to the Techbox, this is the amount of time the Ethernet communication is delayed from broadcasting to the LINKnet network, thus giving the Ethernet switch time to power up. This time can be extended to ensure that the switch is powered up and active, before the LINKnet modules start broadcasting and gets initialized.

Chapter 4 - Using DSE Macros and Templates

Node Addressing the LINKnet Modules

Each LINKnet module must have a unique Node Address assigned to it.
The range allowed in DSE is 1 to 127.

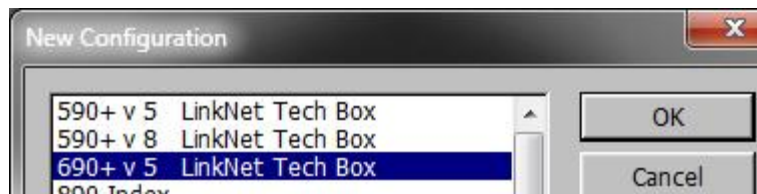
AC690+ and DC590+ Macros/Templates

The DSE program has pre-configured macros for the AC690+ and the DC590+. These macros contain a template for the specific drive. The internal drive parameters are programmed via the template and are stored in the TechBox/TechCard. The macros are loaded every time the drive is energized; thus all drive parameters are loaded into the volatile memory.

Additional *LINK* function blocks may be inserted into the Techbox/Techcard configuration.

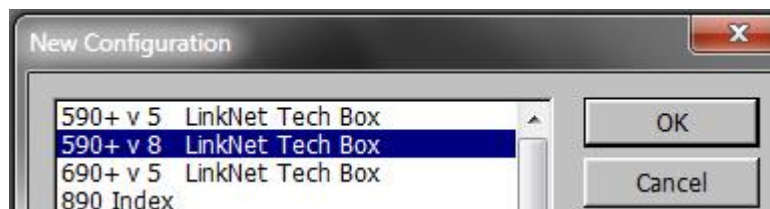
AC690+ Macro Template

The 690+ macro is selected from the **File/New** drop down menu as shown below. This **690+_v5** supports a 690+ drive with firmware version 5.x. If the drive is an earlier firmware version, it can be field upgradeable to the latest firmware, by using DSElite.

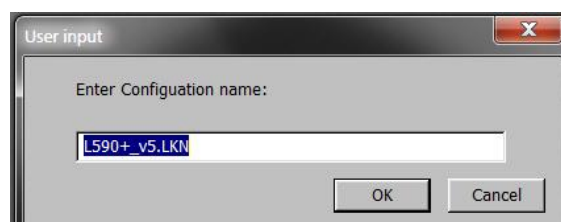


DC590+ Macro Template

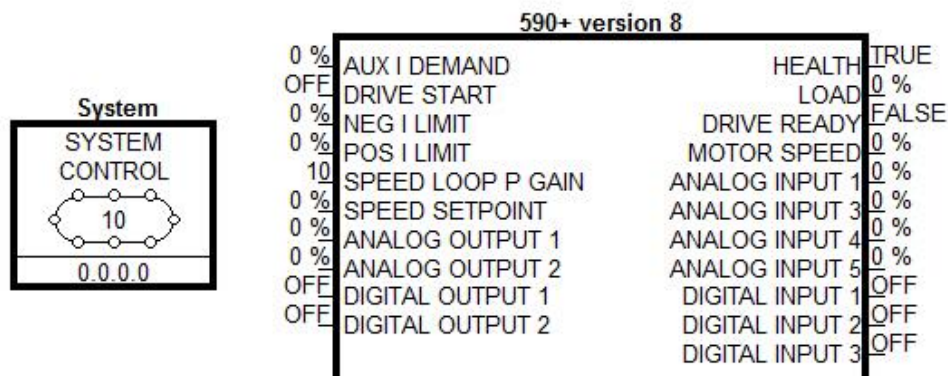
The 590+ macro is selected from the **File/New** drop down menu in DSE. There are two choices: the **590+_v5 LINKnet Techbox** for a 590+ drive with firmware version 5.x and a **590+_v8 LINKnet Techbox** for a 590+ drive with firmware version 8.x drive. In DSElite the choices are the **590v5_f1.LKN** and the **590v8_f1.LKN**. A **590+_v5** template will install into a firmware version 5, 7 or 8 drive. A **590v8f1.LNK** template will install into a firmware version 8 drive only. **Note:** When using a v8 drive, make sure the firmware version is at least version 8.10 or later.



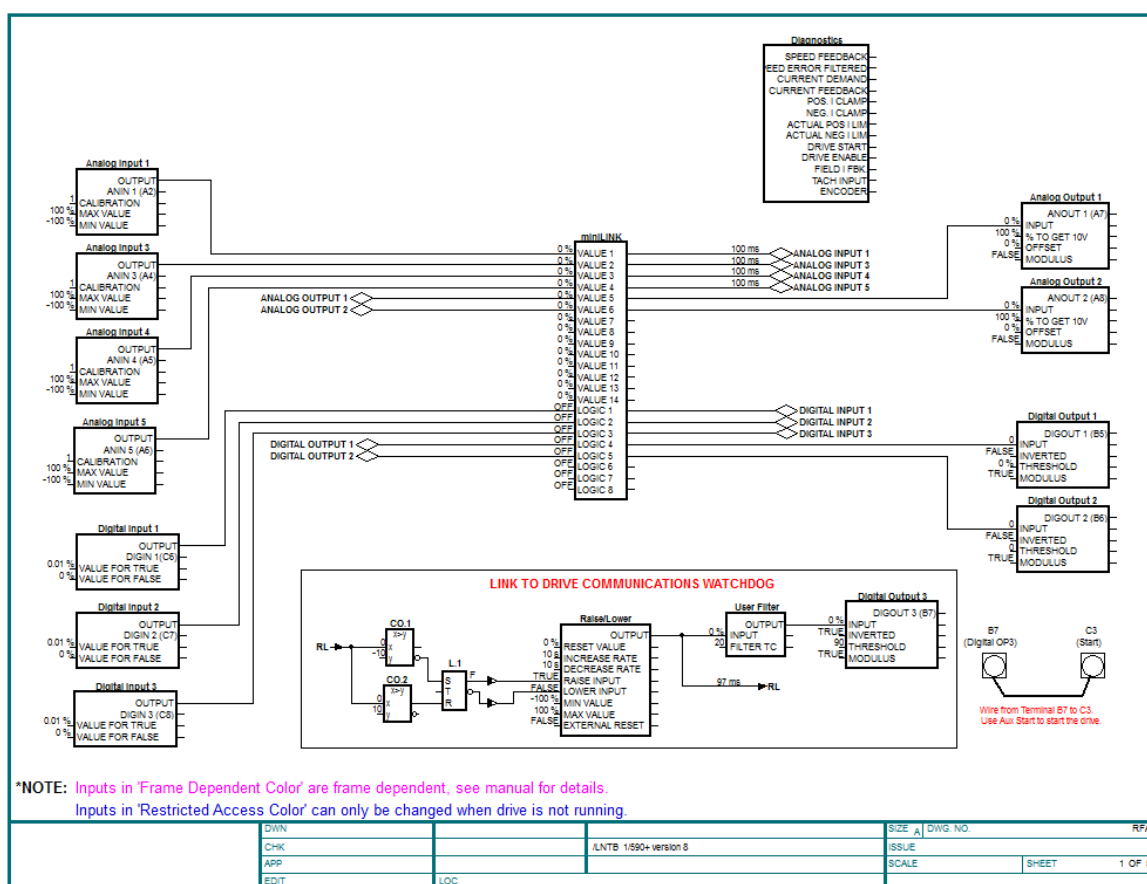
Select the applicable configuration for your drive. The program will prompt you for the module name.



LINKnet L590+ Version 8 Template



The 590+ macro has some preconfigured inputs and outputs as default. If another tag or parameter is needed, it can be added inside the macro. It is possible to use both the drives' internal function blocks and the Link function blocks. Simply double-click on the macro to access the 590+ internal function blocks.



Modifying inside the macro

All the drive functions are available through the TechBox. When using some of the DC590+ drives with firmware version 5.x function blocks, it may be necessary to use the Mini-Link block or a 'Native drive' block as the connection point to the TechBox. If a parameter is Orange in color, it must be connected to a Native drive block. The purpose for doing this is to ensure proper triggering of non-system function blocks.

Note: The DC590+ drive with firmware version 8.x and the AC690+ drives do not require the use of the Mini-Link block or 'Native drive' block to ensure proper triggering. Drive blocks can be connected to other blocks without a triggering problem.

Deleting and/or moving an internal connection

The connections inside the macro can be deleted or moved in the same fashion that is used in DSE.— If the connection is only being moved from one block to another block it is not necessary to delete the external macro connection.

Inserting a new internal connection

Input connection points to the 590+ macro do not need to be connected to the Mini-Link block. When you are adding an output connection point to the 590+ macro it may be necessary to connect to the Mini-Link or system block. If the output connection point is originating from a Native drive block it is not necessary to link the connection to the Mini-Link block.

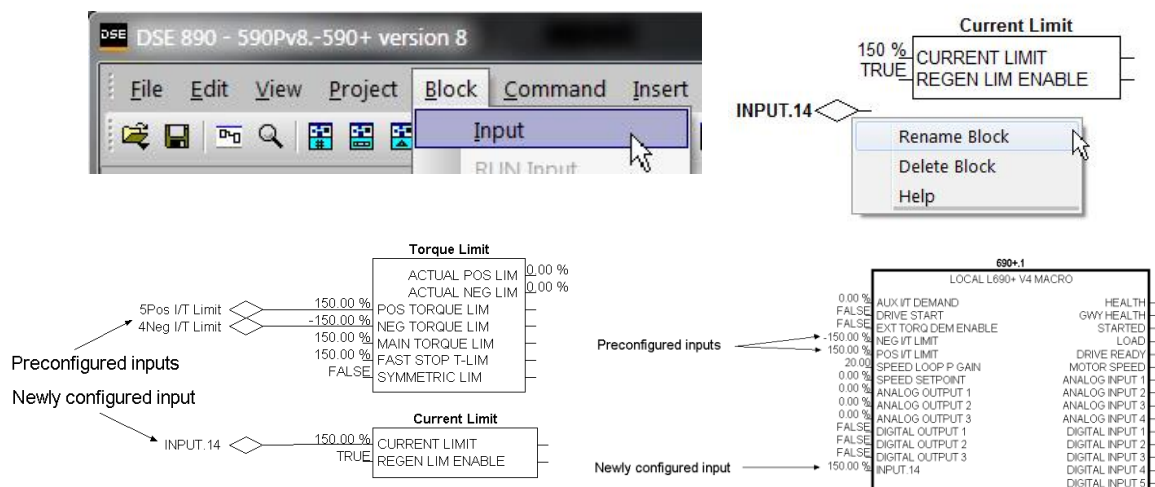
Inserting function blocks

Link function blocks may be programmed into the TechBox. LINK function blocks can be inserted outside or outside the macro. The function blocks are accessed in the same manner as other Link2 modules.

Inserting and deleting macro Inputs/Outputs

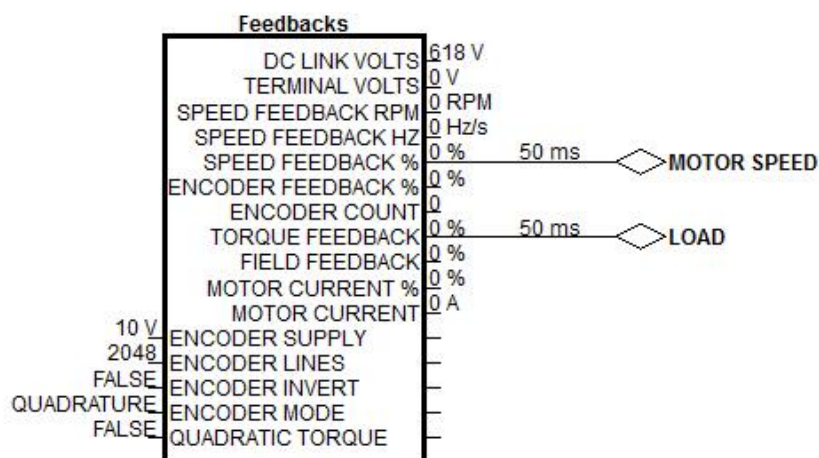
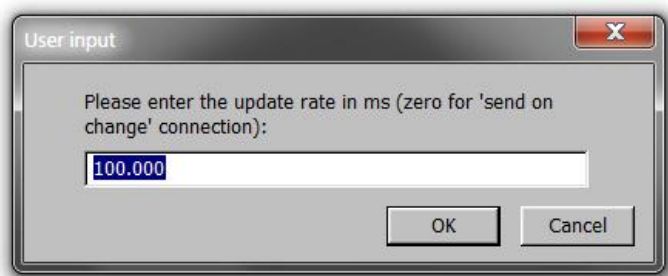
Connections in and out of the macros are made by the following methods.

1. Selecting the inputs and outputs from the BLOCK menu will allow the I/O diamonds to be inserted into the macro. The diamond shaped Input and Output tags can be dropped anywhere inside the drive macro. Drawing a link from the Input/Output diamond to the desired connection point will make the connection to outside the macro.
2. Highlighting the tag and pressing the "DELETE" key will delete inputs or outputs. Prior to deleting the tag, be sure to disconnect all external connections to the macro.

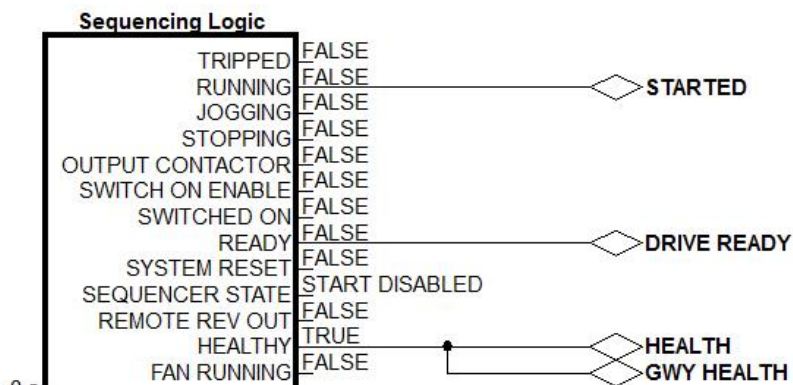


Note: Internal tags do not get a module address or slot address. The tag appears as a connection point on the outside of the macro. Right mouse clicking on the diamond will allow you to change the name of the tag. This name will appear inside and outside the macro. The number preceding the tag name controls the order of appearance on the macro outside connection points. The number may be changed in the same manner as changing the name of the tag. Input connection points to the 590+ macro do not need to be connected to the Mini-Link block. When adding an output connection point to the 590+ macro it may be necessary to connect to the Mini-Link or system blocks.

3. Certain output tags will require an entry for the connection speed. The faster connection speeds require more of the CPU heap usage. If too many fast connections are made, it may be possible to run out of CPU heap and cause an “L-Error” fault. Keep fast connections to a minimum.

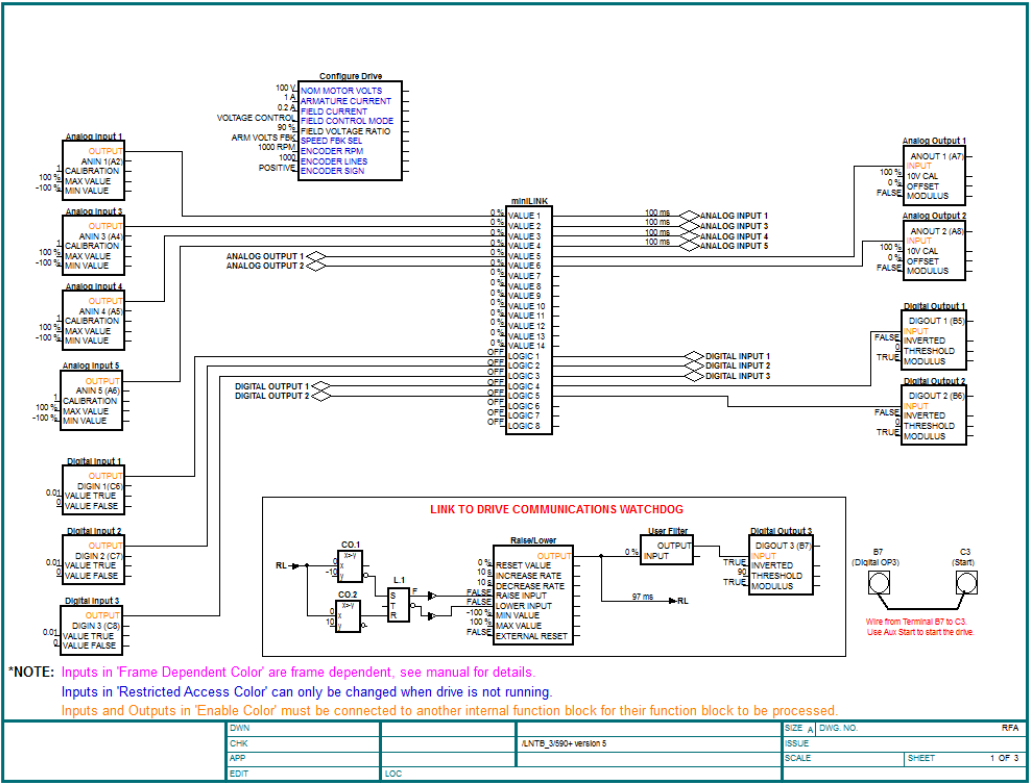


4. A Digital Input or Output will not require a connection speed as they are updated on a change of state only. Meaning that if the state is always True, an Output will not be sent until the state changes to a False. The Digital Outputs are scanned at a default rate of 100 ms. This update rate can be changed by right mouse clicking on the connection line and selecting Update Rate.

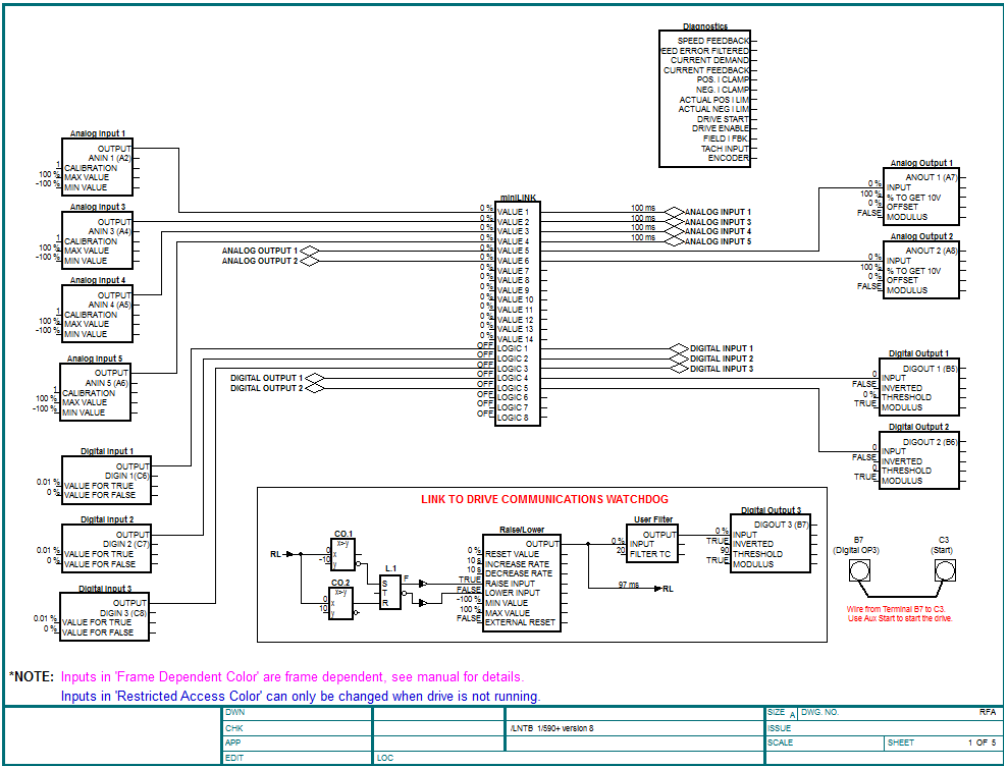


Using Drive I/O

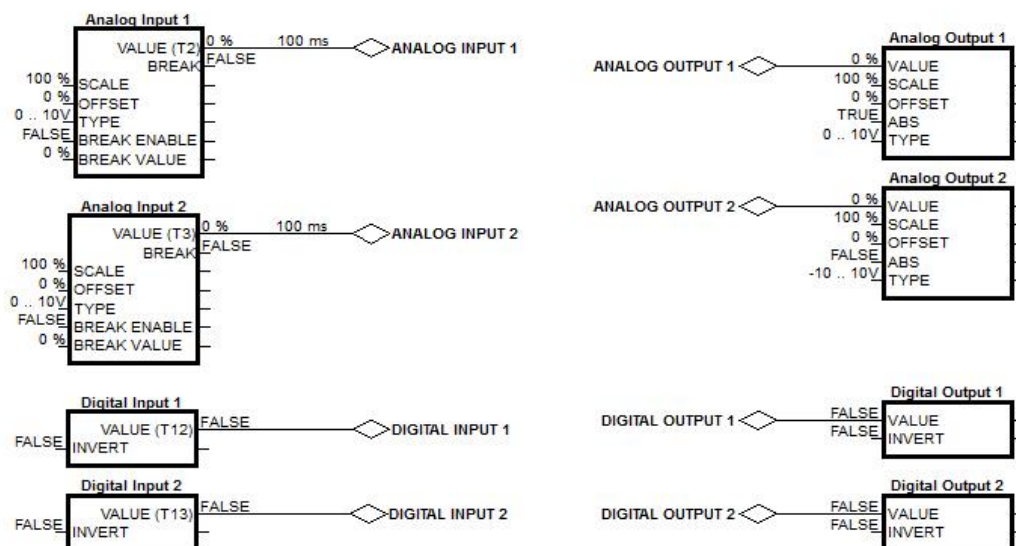
Drive analog and digital inputs are available for use as I/O for the *Link* system. The DC590+ drive firmware version 5.x requires the use of the MiniLink or system function blocks. The DC590+ drive with firmware v8.x and the AC690+ drive don't require the use of the MiniLink or system blocks. But for consistency the Minilink block has been used in the 590+ v8



DC590+ Version 5.x Analog and Digital I/O



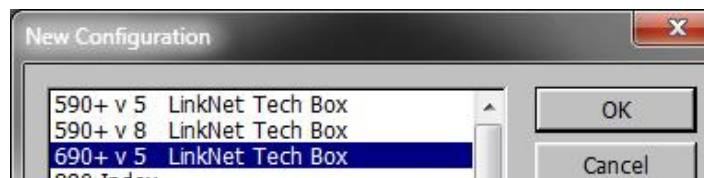
DC590+ Version 8.x Analog and Digital I/O



AC690+ Analog and Digital

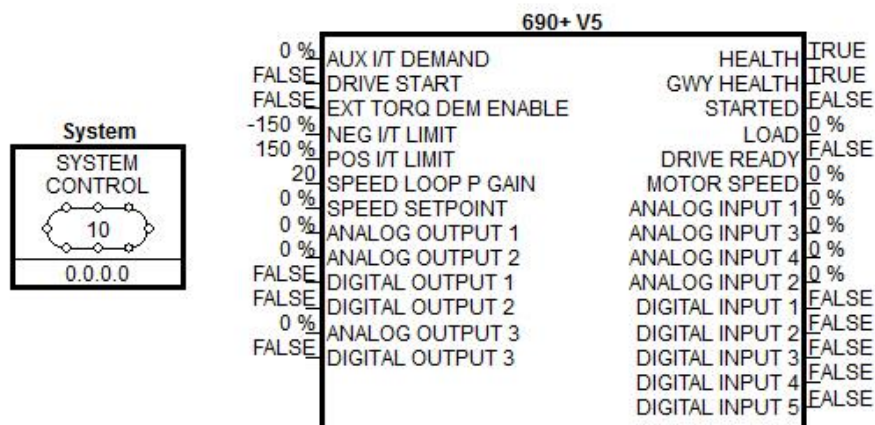
690+ Macro Sample Configuration

Select the 690+ template from the “FILE / NEW” menu.



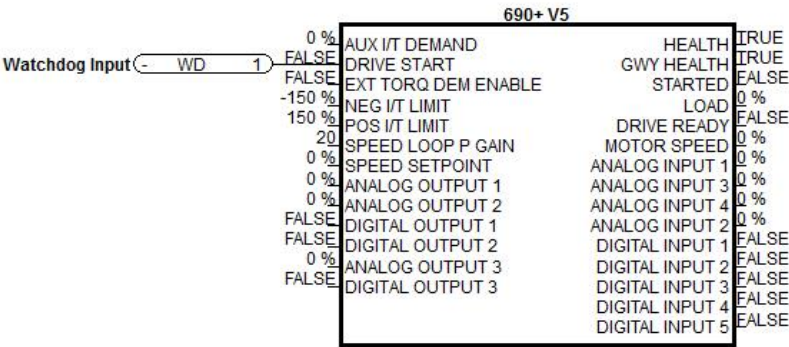
After completing the above steps you should see the 690+ macro without any Link connections as shown below.

LINKnet L690+ version 5 Template



Watchdog Circuit

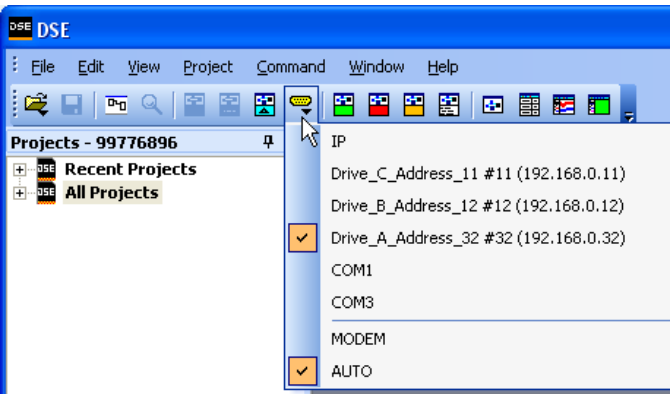
It is recommended that a Watchdog Circuit be implemented in each LINKnet configuration to stop the drive if there is a loss of Ethernet communications. Presently if there is a loss of Ethernet communications on the LINKnet drive, it will continue to run and not fault. Within DSE there is a WATCHDOG INPUT function block located in the BLOCK MENU. It can be connected to the DRIVE START Input in place of an INPUT Slot. It must be updated with a logic True signal. If 5 seconds has passed and it is not updated with a logic True, the Output of the block will go False and the drive will stop and not fault. This WATCHDOG can also be connected to a Digital Output which can be monitored by the user to take further action. For more information on this function block, see the Help Data sheet within DSE.



Chapter 5 – Connecting to the LINKnet Techbox

There are two ways to connect to the LINKnet Techbox. One way is using the USB port and the other way is via Ethernet. The recommended way is the Ethernet, as it is faster. The USB port can be used if there is a problem connecting via Ethernet.

To use the Ethernet connection the pc must be set up to be on the same subnet address as LINKnet. This setup procedure is listed on page 8 of this manual. Once this setup is complete connect the pc's Ethernet cable to a device which is on the LINKnet communications network such as a switch. Then launch DSE. Go to the yellow Serial port Icon and select it. All of the modules which are on the LINKnet will be shown along with the IP Address of each module. Also shown will be which module the Ethernet is connected to.



In the example shown the Ethernet is connected to 'Drive_A_Address_32'. There are 3 modules on this Ethernet. The 'checked box' shows which module DSE is connected via the Ethernet.

The *Module List* will look like the picture shown. The * indicates which module, DSE is connected to.

Module list							
Adrs	Name	Library	Status	CPU %	RAM %	Msg/s In	Errs
*0032	Drive_A_Address_32	LNTB v1.1	OK	5.1	12.2	989	0
0012	Drive_B_Address_12	LNTB v1.1	OK	0.0	2.7	1021	0

CPU % (Peak) indicates the amount of CPU activity, or how busy the microprocessor was since the last update of the module list.

RAM % (Peak) indicates how much RAM(SRAM) the modules CPU has used since the module list last entered the OK state & began executing the installed configuration.

Msg/s In (Messages In/second) Average number of Input Messages per second of network traffic for that module.

Errs indicates the amount of Communication Errors since the Module List was refreshed.

Command / Get Info

A *Command / Get Info* shows the modules *IP Address* as shown below. It also shows the *firmware* build (shown 1.7), the remote boot *loader* firmware (shown R1.2) information and the *Events/s*. This is the number of vm (virtual machine) functions blocks, executing per second. A *node* is a measurement of storage units for vm blocks. There are 3 checksums in parentheses. The first one 096E2B37 is for the v1.7 firmware. The next one 565F772C is for the Remote Boader and the last 46D0A09D is for the Boot Strap loader. Also shown is the RAM in units of *nodes*. A node is the amount of available configuration storage.

Scratch Pad	
-----Module Information-----	
Serial number:	1342-US-8-0388, MAC: 00:0D:46:A9:61:83, IP: 192.168.1.75
Hardware:	LINKnet TB (ROM 12.0, rev. 1 hardware)
Library:	LINKnet Techbox (version 1.7 firmware) - build 1.7 (E7EC109E, 565F772C, 46D0A09D), loader R1.2
Project:	99776899:Chris_w/LINKnet Examples
Configuration:	LNTB-75
Modification:	78
Permanent address:	75
Working address:	75
Persistents used:	2.0% (47 of 2400)
Storage used:	3.2% (33 of 1024 pages)
CPU used (Recent/Peak):	39.6%/39.6%
RAM used (Static/Peak):	7.5%/7.5% (642/642 of 8578 nodes)
Events/s:	15004
Input Messages/s:	11
Status:	OK, drive not started

Installing and updating a configuration for the first time

Using DSE890

1. Using DSE obtain a *Module List*. This *Module List* will show all of the modules in the network.
2. Open the LINKnet configuration which you want to install. Make sure the correct motor data is entered in the *Motor Data* block for the 690+ or in the *Configure Drive* block for the 590+ drive.
3. In the *Module List* highlight the module where you wish to install this configuration.
4. Do a *Command / Install at Selected*. This will install the Application configuration and all of the drive settings, except the *Frame dependent* parameters into the Techbox. Frame dependent parameters appear **magenta** in color in the configuration.
5. Perform an *Autotune* on the drive.
6. Do a *Parameter Save* either from the Drive MMI keypad or from DSE by doing a *Command / Parameters Save*.
7. Now to get the Product Code, Frame dependent and Autotune parameters back into the DSE configuration, do a *Project / Update*.
8. Open the configuration and make sure these Autotune parameters did get updated into the configuration.
9. To get the configuration and the Product Code installed into the Techbox, do a *Command / Install at Selected* or *Full Install at Selected*.

Note: For Cloning of drives, see page 31

Using DSELite

1. Open the LINKnet configuration which you want to install. Make sure the correct motor data is entered in the *Motor Data* block for the 690+ or in the *Configure Drive* block for the 590+ drive.
2. Do a *Command / Install at Selected*. This will install the Application configuration and all of the drive settings, except the *Frame dependent* parameters into the Techbox. Frame dependent parameters appear **magenta** in color in the configuration.
3. Perform an Autotune in the drive.
4. Do a *Parameter Save* from DSELite by doing a *Command / Parameters Save*. **Do not** do a *Parameter Save* from the MMI. The *Parameter Save* **MUST** be done from DSELite
5. Close the configuration.
6. Do a *File / Extract*. Then do a *File / Save As*.
7. To get the configuration and the Product Code installed into the Techbox, do a *Command / Install at Selected* or *Full Install at Selected*.

Cloning of Drives

If the above procedure is followed, the **P CODE** (**P**roduct **C**ode) of the drive, will be stored in the LINKnet Techbox, for that specific configuration. The P CODE is the Power Output rating of the drive, including *frame dependent and reserved menu* parameters, which are specific to each individual P CODE.

The *frame dependent* parameters appear **magenta** in color, in the configuration.

If this 'programmed' Techbox is removed and then installed on another or new drive of an **identical** P CODE, all of the parameters including the *frame dependent & reserved menu* parameters will be installed into this new drive. Thus this new drive will be an identical clone of the original drive.

If this 'programmed' Techbox is removed and then installed on another or new drive with a **different** P CODE, **none** of the *frame dependent* or *reserved menu* parameters will be installed into this new drive. Only the basic parameters will be installed.

Thus motor data or other parameters will not get installed into this new drive. The drive may not operate properly or damage to the motor may occur. These motor parameters should be set in the drive and an Autotune should be performed.

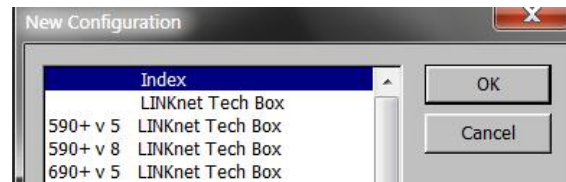
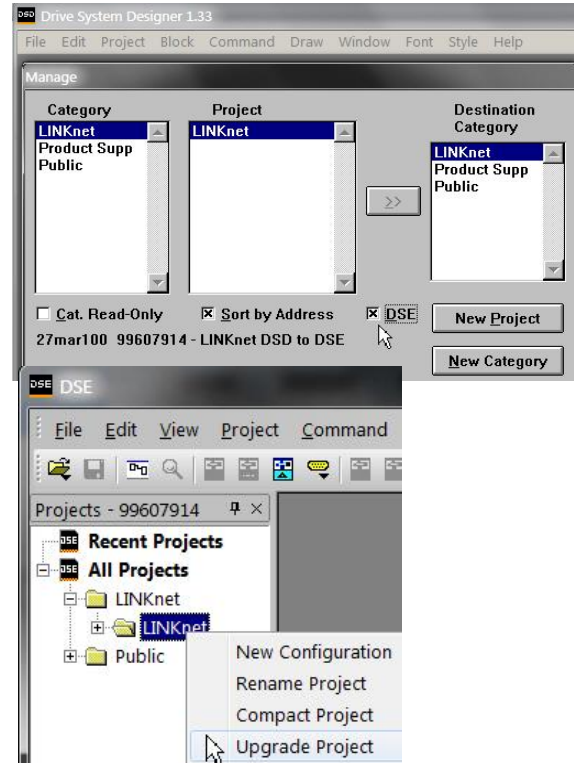
If you want to get this new drives P CODE back into the Techbox:

1. Set the required motor data in the drive, then perform an Autotune
2. Do a *Parameter Save* either from the Drive MMI keypad or from DSE by doing a *Command / Parameters Save*.
3. Now to get the Product Code, Frame dependent and Autotune parameters back into the DSE configuration, do a *Project / Update*.
4. Open the configuration and make sure these Autotune parameters did get updated into the configuration.
5. To get the configuration and the Product Code installed into the Techbox, do a *Command / Install at Selected* or *Full Install at Selected*.

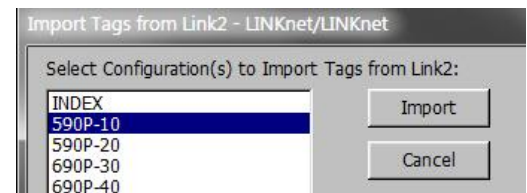
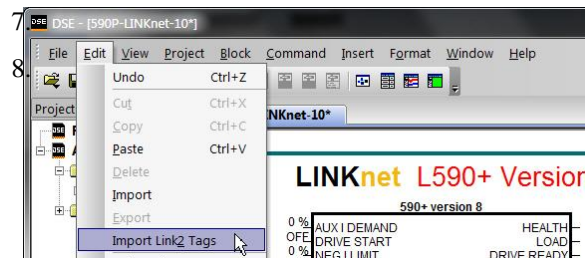
Chapter 6 – Extracting the DSD Configuration data

If you have an existing DSD project which contains 590+ and 690+ drives, you can extract the motor data as well as all of the configuration parameter data only and Import it into a DSE LINKnet configuration. (Parameter data only, will be imported into the LINKnet template. Connections lines' or Link blocks will NOT be imported). Thus the Autotune data can be preserved and an Autotune will not have to be performed on the LINKnet drives. Follow this procedure:

1. Launch DSD (Drive System Designer) and select PROJECT / MANAGE. Locate the DSD PROJECT which is being converted into a DSE LINKnet project. Select the CATEGORY and then the PROJECT.
2. In this example the PROJECT selected is LINKnet. To get this project to appear into DSE, select the "DSE box" as shown. Then select DONE.
3. Launch DSE and go to ALL PROJECTS as shown. The DSD project now appears as shown here in this LINKnet example.
4. Then right mouse click on the LINKnet project and select UPGRADE PROJECT. This will upgrade the DSE project to the latest, thus all of the current DSE configurations will be available including LINKnet.
5. Then right mouse click on the LINKnet project and select NEW CONFIGURATION. Then select the appropriate 590+ or 690+ LINKnet configuration. Name the configuration.



6. With the configuration open, select EDIT / IMPORT LINK2 TAGS. Then select the DSD configuration which you want to Import. Native parameter data only (like Motor current, Accel Time and etc.) will be imported into the LINKnet template. Connections lines' or Link blocks will NOT be imported. Link blocks will have to be manually added.



Chapter 7 – Extracting Drive data into a new template

1. If you have an existing 590+ or a 690+ drive and you want to extract the native drive tag parameter data in to a new LINKnet configuration, this can be done. The data extracted, will be the drive native parameters only. (Like Motor current, Accel Time etc.). No connection lines will be drawn or extracted. Also, if this drive has a Link Techbox on it, none of the VM (Virtual Machine) Link parameter blocks will be extracted. Link blocks will have to be manually added. Thus, the Autotune data can be preserved and an Autotune will not have to be performed on the LINKnet drive.

This is the procedure:

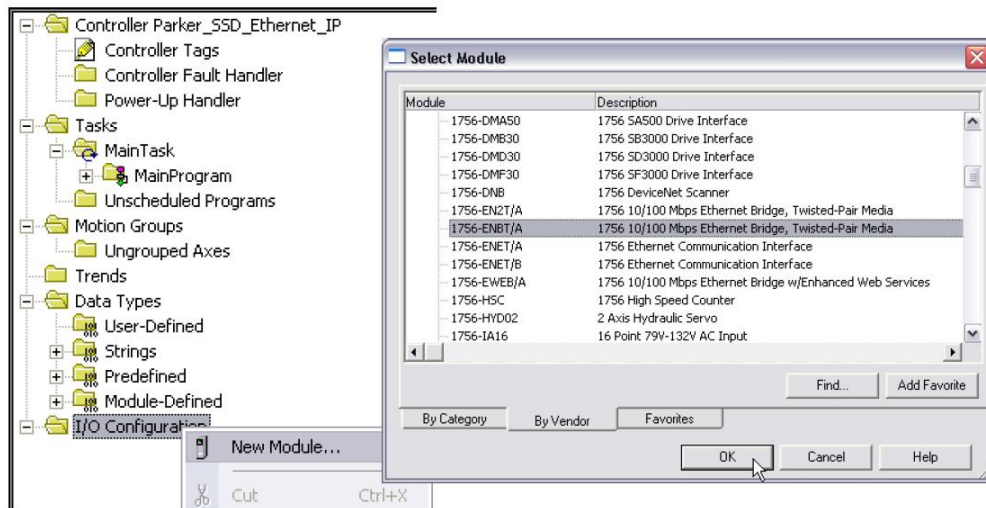
1. Launch DSE890 and open the LINKnet configuration which you want to have the drive parameters extracted from the drive. The configuration type must match the drive type, meaning that if the drive is a 690+ the LINKnet configuration template must be for the 690+.
2. Connect the RS232 Comms cable to the P3 port of the drive. (This is the same comms cable used when using DSElite and communicating to a standard 590+ or 690+ Digital drive).
3. Do a COMMAND / REFRESH FULL and view the message in the Scratchpad to make sure DSE890 is communicating to the drive. There should be a message something like:
590P version 8.10 (connected, drive NOT running).
4. Do a COMMAND / EXTRACT DRIVE PARAMETERS.
5. Do a FILE / SAVE. The native drive parameters have now been updated into the configuration.

Note: When doing this procedure on a 690+ drive, if the LINKnet template is for a firmware version 5 drive. DSE will EXTRACT DRIVE PARAMETERS from a 690+ drive firmware version 3, 4 or 5 into a version 5 template.

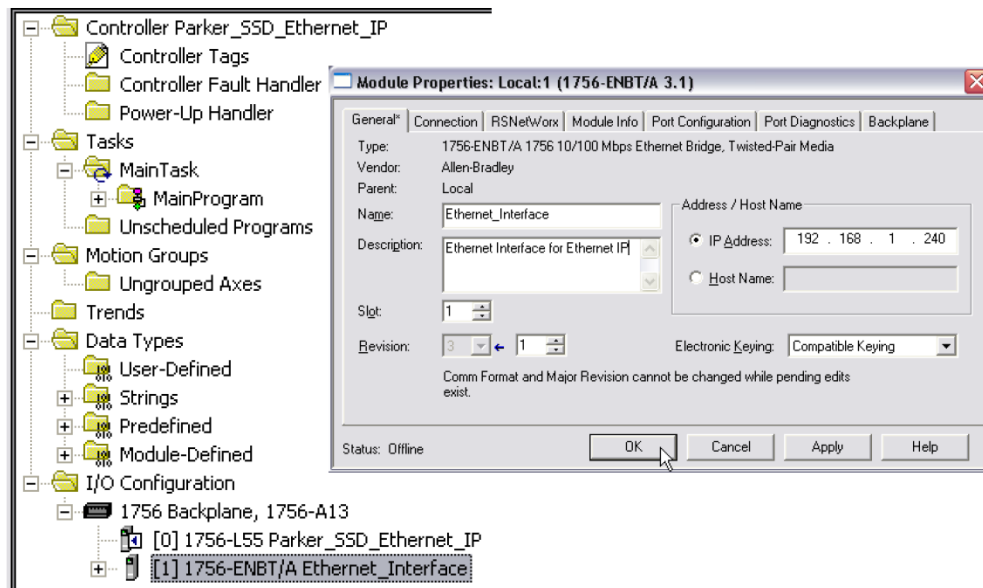
Chapter 8 – AB EtherNet /IP server (slave) Example

Allen Bradley ControlLogix

1. Start a new program and select the PLC processor and chassis type that is used in your project. Our example uses a 1756-L55A processor and 1756-A7/B rack. Remain Offline until you are ready to download the program.
2. Using the I/O Configuration insert the Ethernet interface that will be installed. Right click on the I/O Configuration, select New Module. Our example uses 1756-ENBT/A. Input the desired IP address and slot in the PLC.

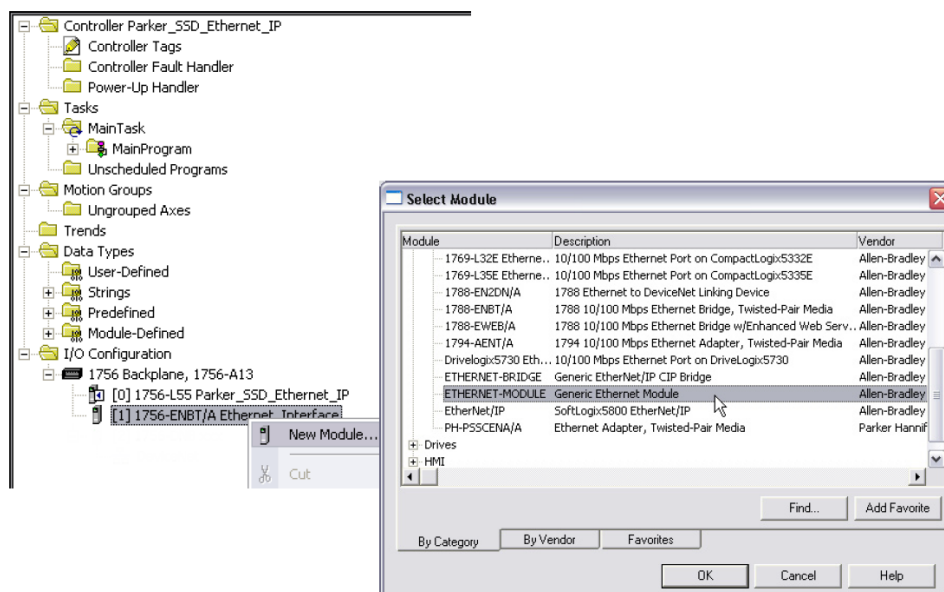


Ethernet Interface Selection



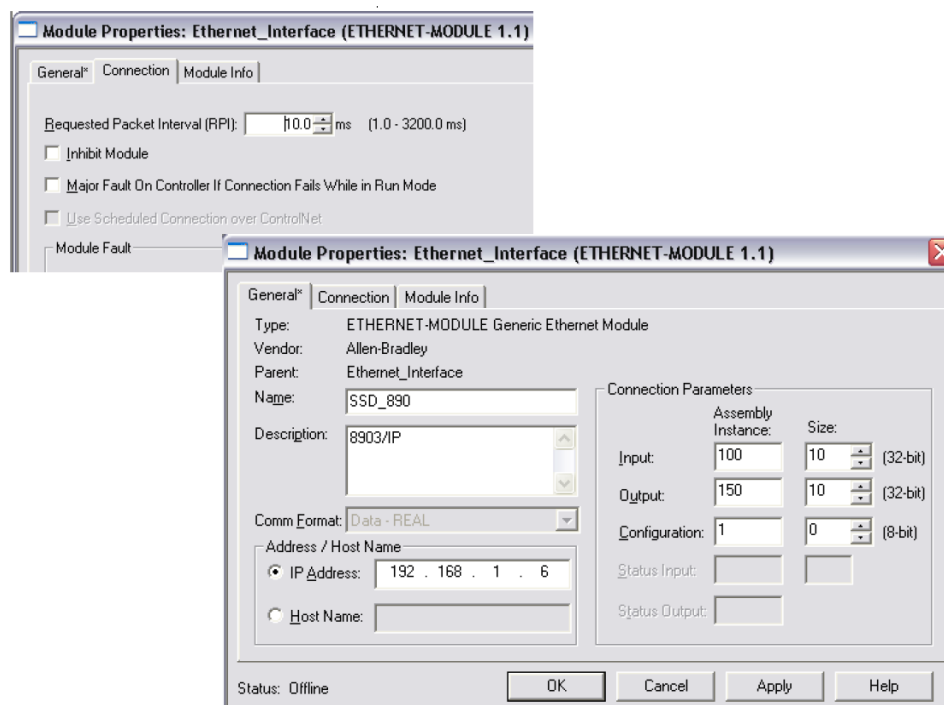
Ethernet Interface Setup

- Right click on the Ethernet Interface Module, select New Module. This screen will allow the selection of the Generic Ethernet Module.



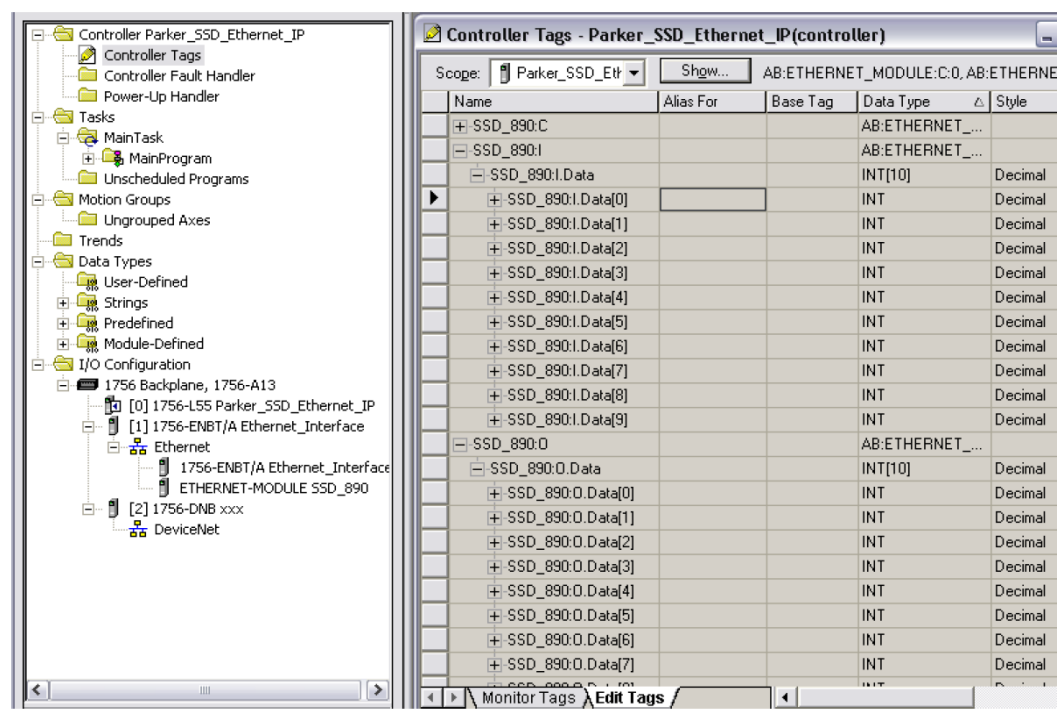
Generic Ethernet Module Select

- Input the desired module name and IP address. The Comms format will be DATA Int if 16-bit signed integer, or Data-REAL if 32-bit floating point. The Input Assembly Instance is 100 and the Output Assembly Instance is 150.
- Click on Next to change the Requested Packet Interval (RPI). The default value of 10ms should be sufficient. If the RPI is set below 5ms unreliable communications may be experienced.



Generic Ethernet Module Setup

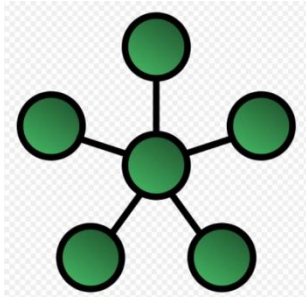
6. When completed with the setup of the Generic Ethernet Module it can be downloaded to the PLC. For testing purposes it is not necessary to program Ladder Logic in the PLC. The data can be accessed and monitored via Controller Tags.



Controller Tags

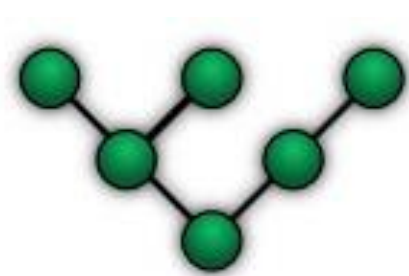
Chapter 9 – Ethernet Network Topology & EDS file

When configuring the Ethernet topology – i.e. connecting the LINKnet Techbox's together in a system with Ethernet switches, it is recommended to use a *Star* configuration. A *Tree* configuration will work.



Star Configuration

Recommended



Tree Configuration

If possible, do not use a *Daisy Chain* topology as this type adds propagation delays each time data passes from module to module.



Daisy Chain Configuration

Not Recommended

EDS file

If required an Electronic Data Sheet (.eds) is available. It can be downloaded from www.parker.com/ssdusa/software under the **Various AC/DC Drives Communication Files** menu.

Chapter 10 - 590+ & 690+ Parameter Over range

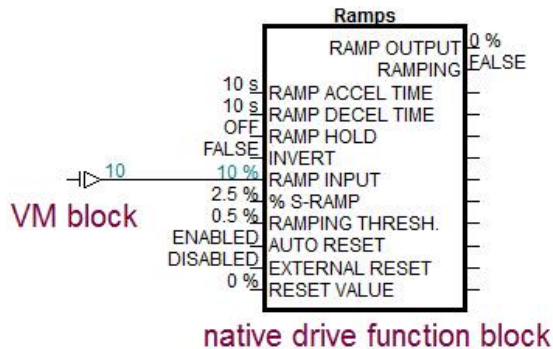
All of the drive parameters inside the “Macro” of 590+ and 690+, drive are considered *native* drive parameters.

Each one of these parameters have a settable Minimum and Maximum range when using the MMI keypad. Thus when using the MMI keypad, you can never exceed a parameter range. Also if an input parameter has a connection line drawn to it and this connection line is connected to another *native* drive parameter inside this *Macro*, the Minimum and Maximum ranges are checked. Thus the parameter ranges can never be exceeded even when it is being written to.

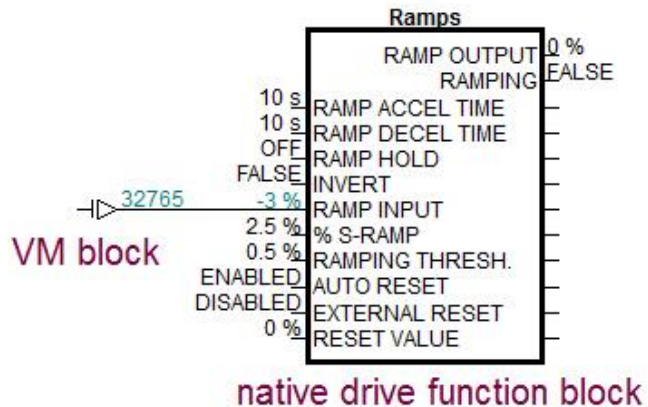
In DSE additional function blocks are available in the *Block* menu. These function blocks are considered **VM** or **Virtual Machine** blocks. These VM function blocks can be added to a 590+ or 690+, configuration. A VM block can be deleted or added to a configuration. A *native* drive parameter block can never be deleted from a configuration. It is part of the drive.

If a VM function block is connected to the Input of a *native* drive parameter, the Minimum and Maximum ranges are not checked. This could cause problems in the drive. If the range is exceeded on these native drive parameters, the drive will either stay at the last valid value or it may change to an undesirable value.

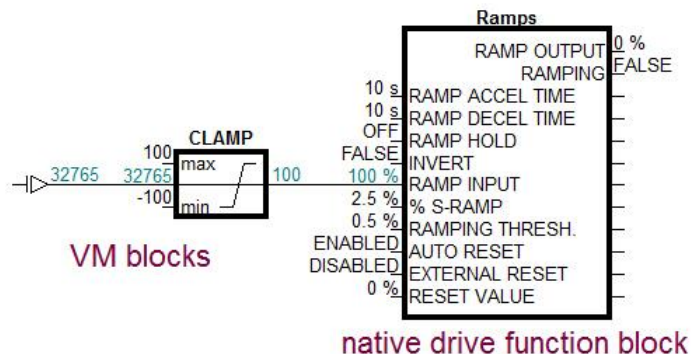
In this example the VM block is sending a valid value of 10% to the *Ramp Input*.



In this example the VM block is sending a value which is out of range for the *Ramp Input* parameter. The *Ramp Input* parameter does not accept this value as shown.



To prevent this condition a *Value / Clamp* function block can be used.



Chapter 11 - Link Drives to LINKnet conversions

If converting a 620Link, 590Link or 590+ Link Techbox Drive to LINKnet, there are some scaling differences between these drives and LINKnet. They are scaled such that 100% from Link is 120% in the drive and 100% from the drive is 83.3% in Link. LINKnet has no scaling. Also, the Link drives “Health word” parameter may be in a different format (Integer or Hex) compared to the replacement drives format. So, this may have to be addressed.

590+ Link Drive information

In the 590+ drive there are scaling differences between the drive and Link. They are scaled such that 100% from Link is 120% in the drive and 100% from the drive is 83.3% in Link. LINKnet has no scaling differences between the drive and any of the function blocks.

620Link Drive information

When the 620L drive is used in a LINK system, or LINK Function Blocks are installed in the 620L Processor, the scaling between the 620 block diagram and LINK can be confusing.

Scaling is necessary as LINK has a value range of +/-100% and the 620L has value ranges of up to +/-300%.

Note: DSD can display the scaling of parameters. Click on the parameter with Control and Shift depressed.

Dedicated Speed and Torque (or Current) parameters have fixed scaling to provide compatibility with the application specific LINK function blocks, such as Section Control, Master Ramp, and the CPW and SPW Winders. All other parameters are scaled by the Maximum range of the parameter.

Speed dedicated parameters.

These are scaled such that 100% from LINK is 120% in the 620L, and 100% from the 620L is 83.3% in LINK.

The following parameters are Speed dedicated:

620L	690 equivalent parameter	
<i>Speed Loop:</i>	<i>Block</i>	<i>Parameter</i>
Total Speed Demand	Speed Loop:	Total Spd Demand%
Speed Feedback	Feedbacks:	Speed Feedback %
Speed Error	Speed Loop:	Speed Error %
 <i>Stop Rates:</i>		
Stop Zero Speed	Reference Stop:	Stop Zero Speed
 <i>Speed Setpoints:</i>		
Direct SPT1	Speed Loop:	Direct Input Select
Direct SPT. Max	Direct IP Pos Lim	
Direct SPT. Min	Direct IP Neg Lim	
Main Spd.Spt	Reference:	Speed Setpoint or Speed Trim
Max Speed	Reference:	Max Speed
Min Speed	Reference:	Max Speed
 <i>Ref Encoder:</i>		
Ref Speed	Encoder Speed Calc1: Speed	
	Encoder Speed Calc2:Speed	

Torque and Current dedicated parameters.

These are scaled such that 100% from LINK is 200% in the 620L, and 100% from the 620L is 50% in LINK (the maximum range may be limited to less than 200% in the 620L).

The following parameters are Torque or Current dedicated:

620L	690 equivalent parameter
<i>Torque Loop:</i>	<i>Block Parameter</i>
Torque Demand	Speed Loop: Torque Demand %
Torque Feedback	Feedbacks Torque Feedback %
Current Feedback	Feedbacks Current Feedback %
Pos Torque Limit	Torque Limit Pos Torque Limit
Neg Torque Limit	Torque Limit Neg Torque Limit
Main Torque Limit	Torque Limit Mian Torque Limit

To ensure compatibility between the Application Specific LINK function blocks, Section Control, Master Ramp, CPW and SPW, the Speed Demand output from the Function block, should be connected to the Main Speed Spt. in the 620L and not to a Setpoint Sum.

The Pos and Neg Current Limits to the 620L, and Speed and Current feedback signals from the 620L to the Function blocks will be correctly scaled.

These application specific function blocks are internally scaled to set and display the speed and current/torque parameters in the actual drive values. Thus although 100% Speed is actually 83.3% in LINK it will be displayed in these function blocks as 100%. This will not be the case with generic LINK function blocks.

Standard Scaling:

The scaling is defined by the Max value of the parameter (see the Tag list in Appendix D of the 620 manual).

For example, the Setpoint Sum 2 Limit (tag 370) has a maximum value of 300%. Therefore a value of 100% in LINK sent to the Setpoint Sum 2 Limit will produce a value of 300%. If a Limit value of 100% is desired then the LINK value must be 33.3%. Similarly if the Limit value is 100% and this is connected to the input of a LINK function block the LINK value will be 33.3%.

Examples:

<i>LINK O/P</i>	<i>----> 620 Parameter</i>	<i>Max</i>	<i>Value</i>	<i>----> LINK I/P</i>
100%	Setpoint Sum 2 Limit	300	300%	100%
100%	Setpoint Sum 2 Input 1	100	100%	
100%	Setpoint Sum 2 Ratio 1	3.00	3.00	
10V	Analog I/P1 Tag 390	300	100%	33.3%
33.3%	Analog O/P1 Tag 354	300	100% = 10v	

The Analog inputs and outputs can be internally scaled if desired. For example:

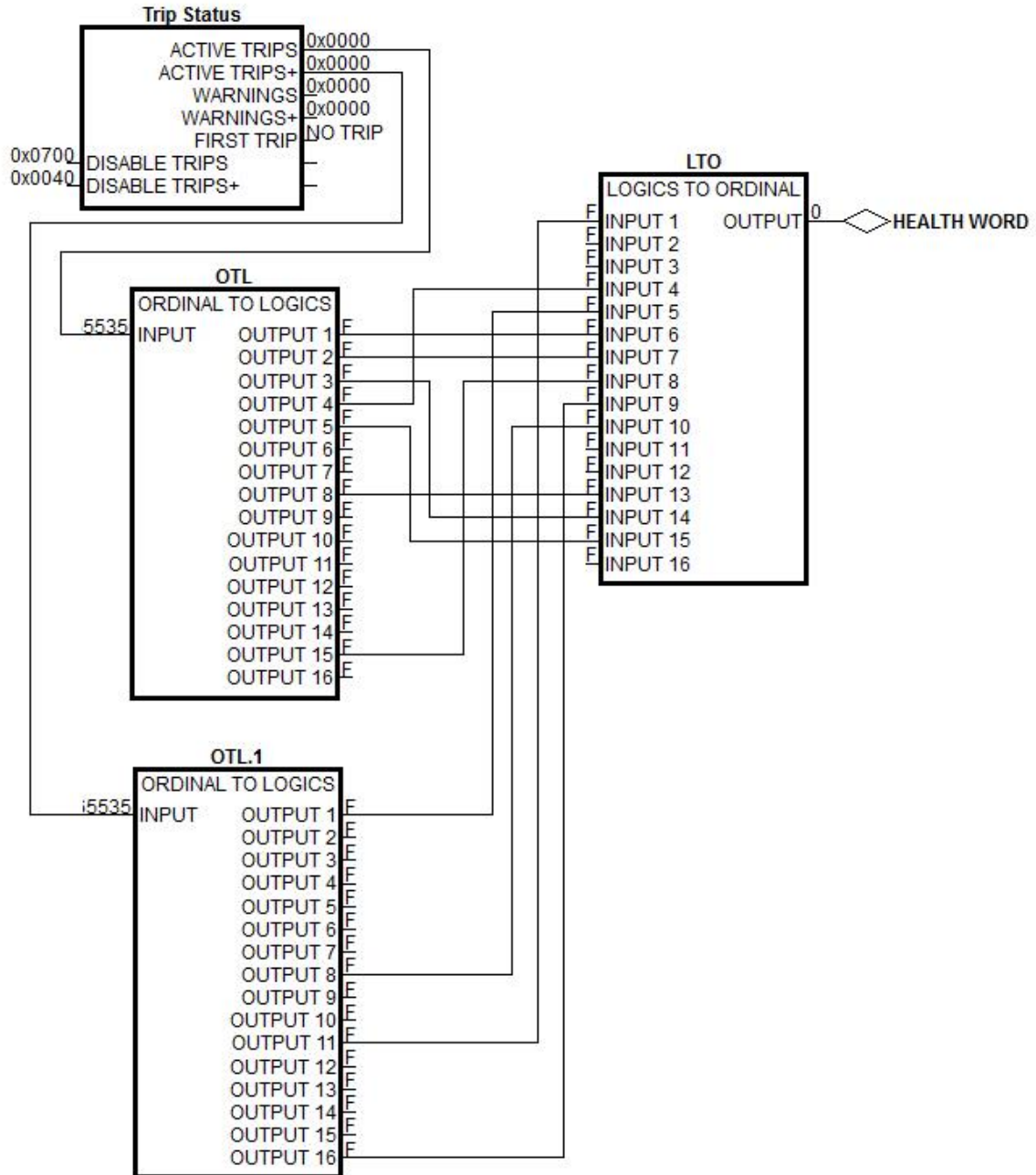
In Analog I/P 1 set the Cal to 300% and the Max Val to 300%, now 10V input will produce 100% in LINK.

In Analog O/P 1 set “% to get 10V” to 300%, now 100% from LINK will produce an output of 10V.

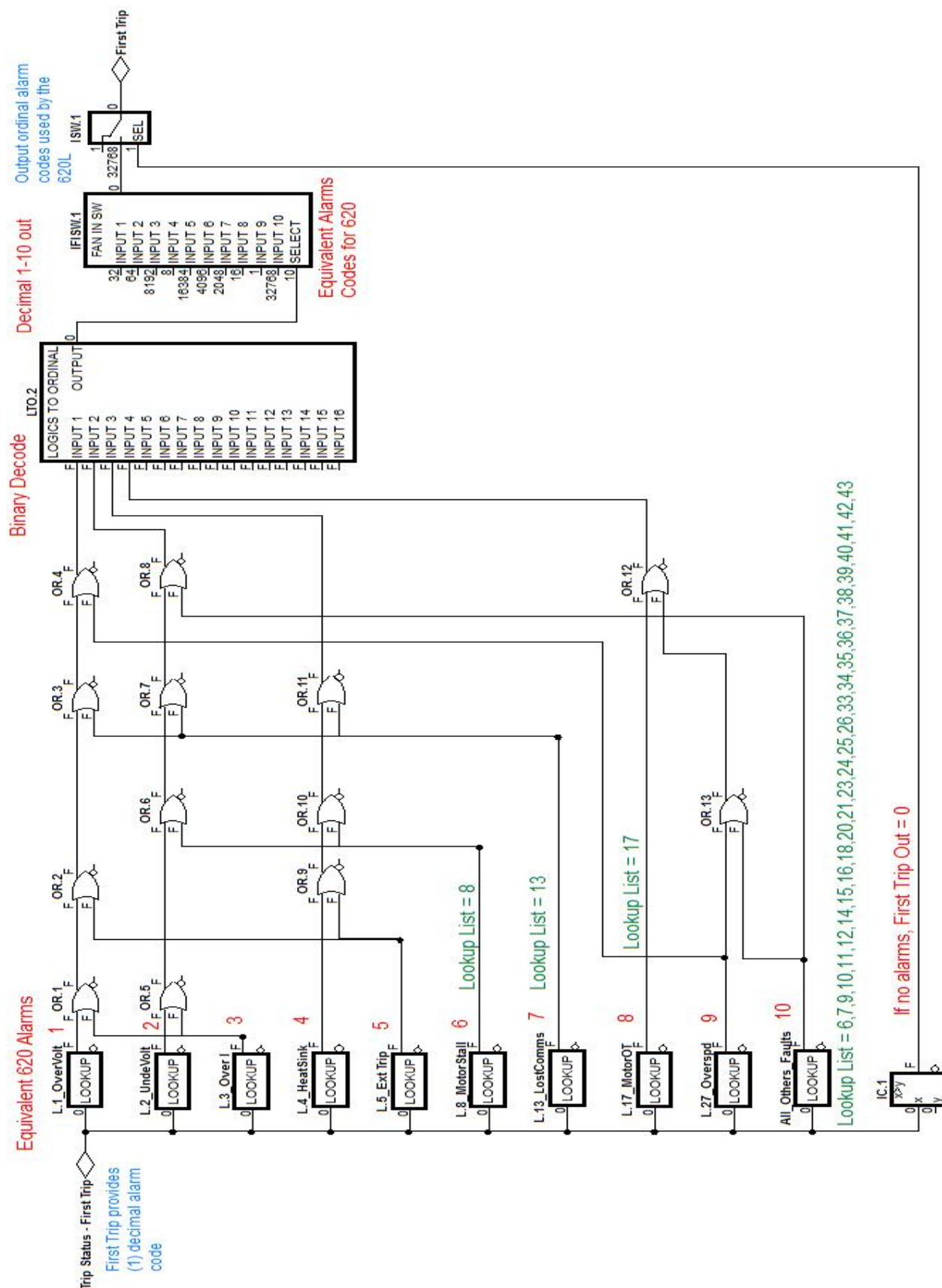
(Note the analog outputs may have offsets, these can be compensated for with the Offset and Calibration parameters)

620L Alarms;

In the 620L drive the **Health Word** is in a hexadecimal format. In the 690+ drive the equivalent function block is the Trip Status. This block has a **First Trip** and an **Active Trips** and an **Active Trips+**. This first circuit will emulate the 620 drive **Health Word**. If you want the 690+ to emulate the 620 **First Alarm** you can use the circuit on the next page.



This circuit will emulate the 620 **Health Word** in a 690+ drive.



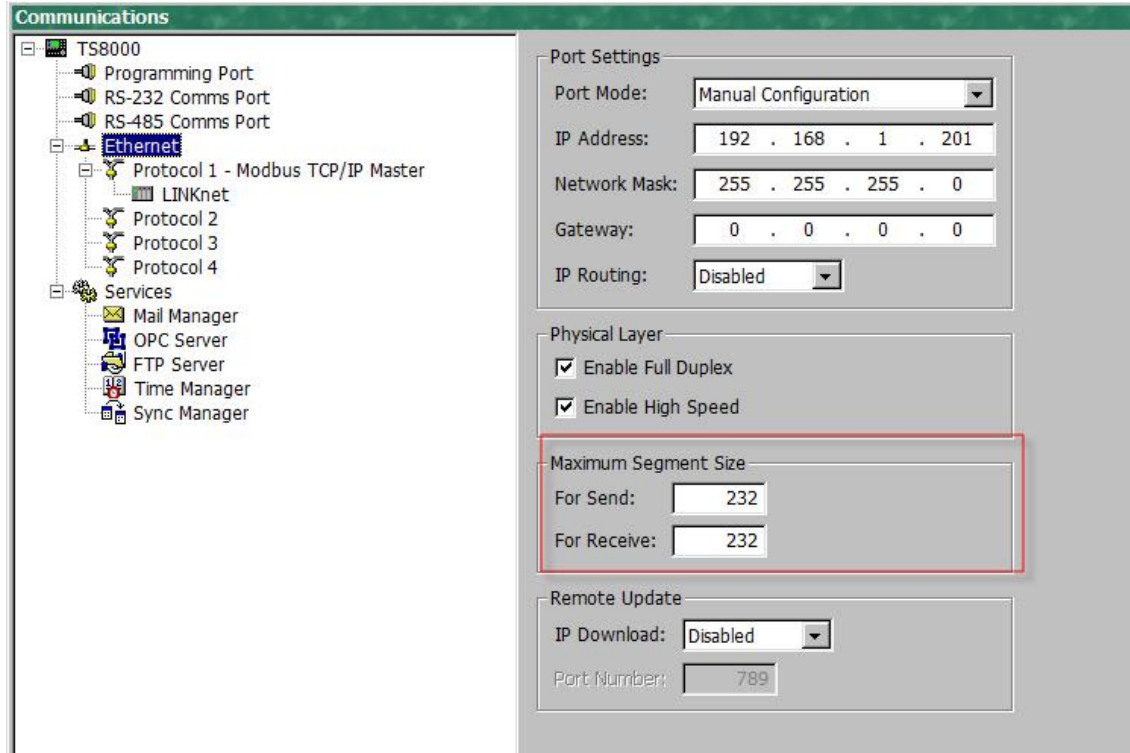
This circuit will emulate the 620 **First Trip** in a 690+ drive.

Chapter 12 – Programming TS8000

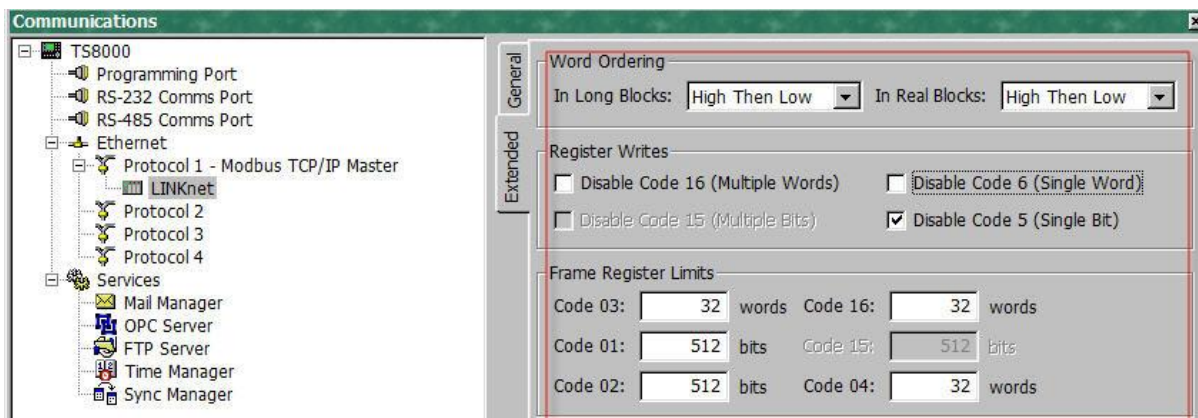
Required Modbus Settings

There are some settings / limits that are required for the TS8000 communications.

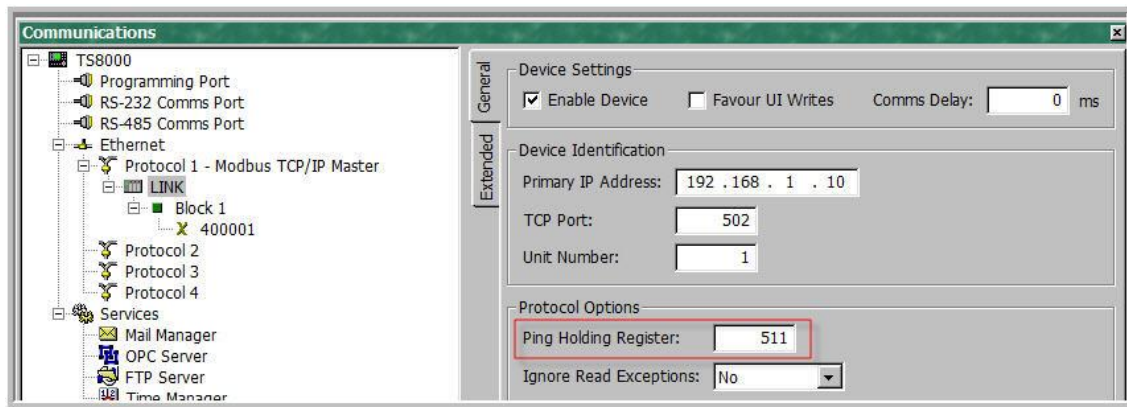
The *Maximum Segment* (Ethernet packet) size is 232:



In the *Extended* Settings, the Word Ordering, Register Writes and the Frame Register Limits need to be set as shown below:



For each LINKnet module the *General / Ping Holding Register* must be set to 511. If set to 0, this disables it. Either setting is acceptable.



NOTES:

1. When powering up the TS8000, the outgoing data is only sent once to the remote devices. If the TS8000 powers up first or before the other devices, the TS8000 will send this outgoing data before the other devices have time to power up and they will not receive any of this data. To solve this issue the TS8000 must power up last or set up the command word to resend the data to the TS8000.
2. The TS8000 only sends the same data value, 1 time. Thus if a value of 10 is sent, it will not re send this value of 10 again even if it is requested to. The value must be changed to a different value like 11, then the value of 10 can be sent.
3. It is recommended that the TS8000 sends 32 bit values to the LINKnet Techbox, instead of 16 Bit values, as both devices are 32 bit. Set it up for "Word is Long".
4. Within the LINKnet Techbox, it is recommended not to access the Remote I/O data, faster than 5 ms.

Example: Configuring a TS8000 to communicate to a LINKnet Techbox

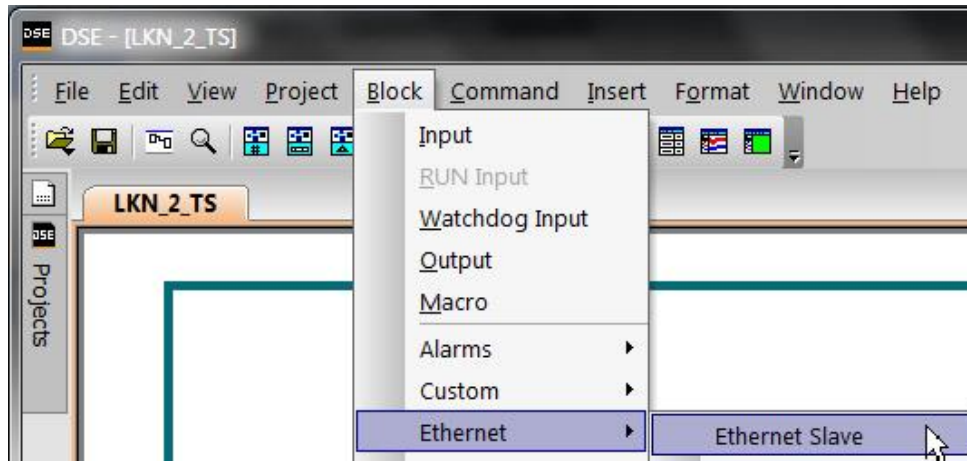
Step 1: Configuring the Modbus Slave Option using DSE

Step 1.1: Inserting a Modbus Slave Function Block

(The 'DSI' & 'DSE' Example discussed in this manual is located in the directory C:\SSD_LINK\HELP\WIN3. The files are called: LKN_2_TS.DSI & LKN_2_TS.LKN.)

Display your configuration page. Click on the "Block" menu at the top of the screen.

1. Move the cursor down to select "Ethernet" and select "Ethernet Slave".
2. Click to attach the block icon to the cursor. Move the icon to where you want on the screen. Click again to release the icon.



Step 1.2: Attaching Fieldbus Connectors

Seven fieldbus connector types are available:

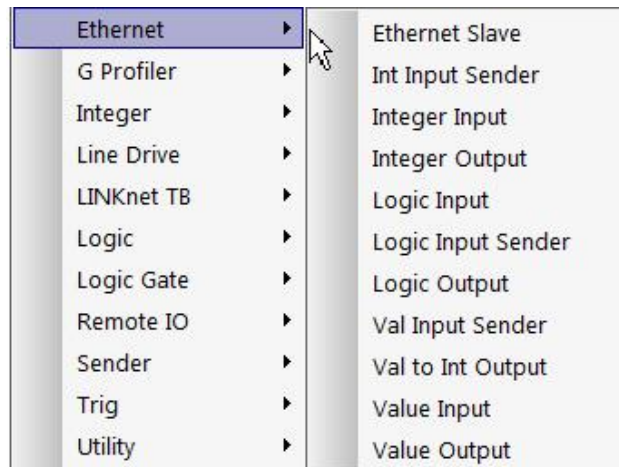
Logic Input	Integer Input	Value Input	
Logic Output	Integer Output	Value Output	FB Val to Int Output

Input connector: the data is sent from the TS8000 to LINKnet

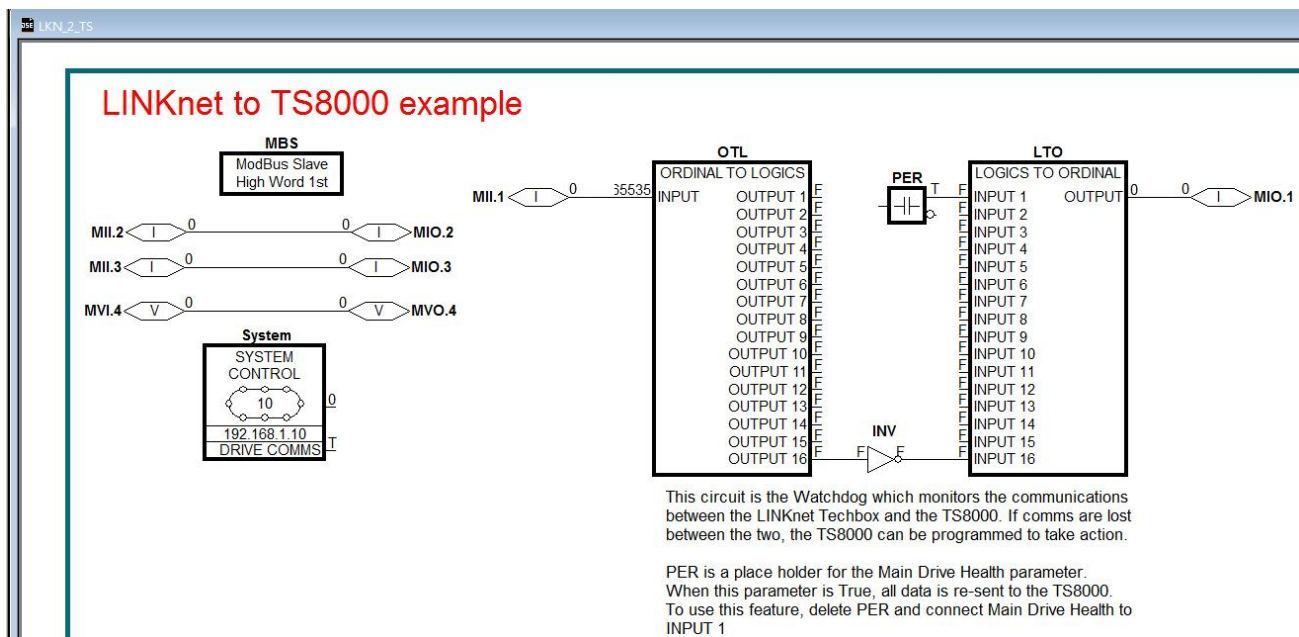
Output connector: the data is sent from LINKnet to the TS8000

The fieldbus connectors must be added before they will appear in the EtherNet function block.

The function block and connectors

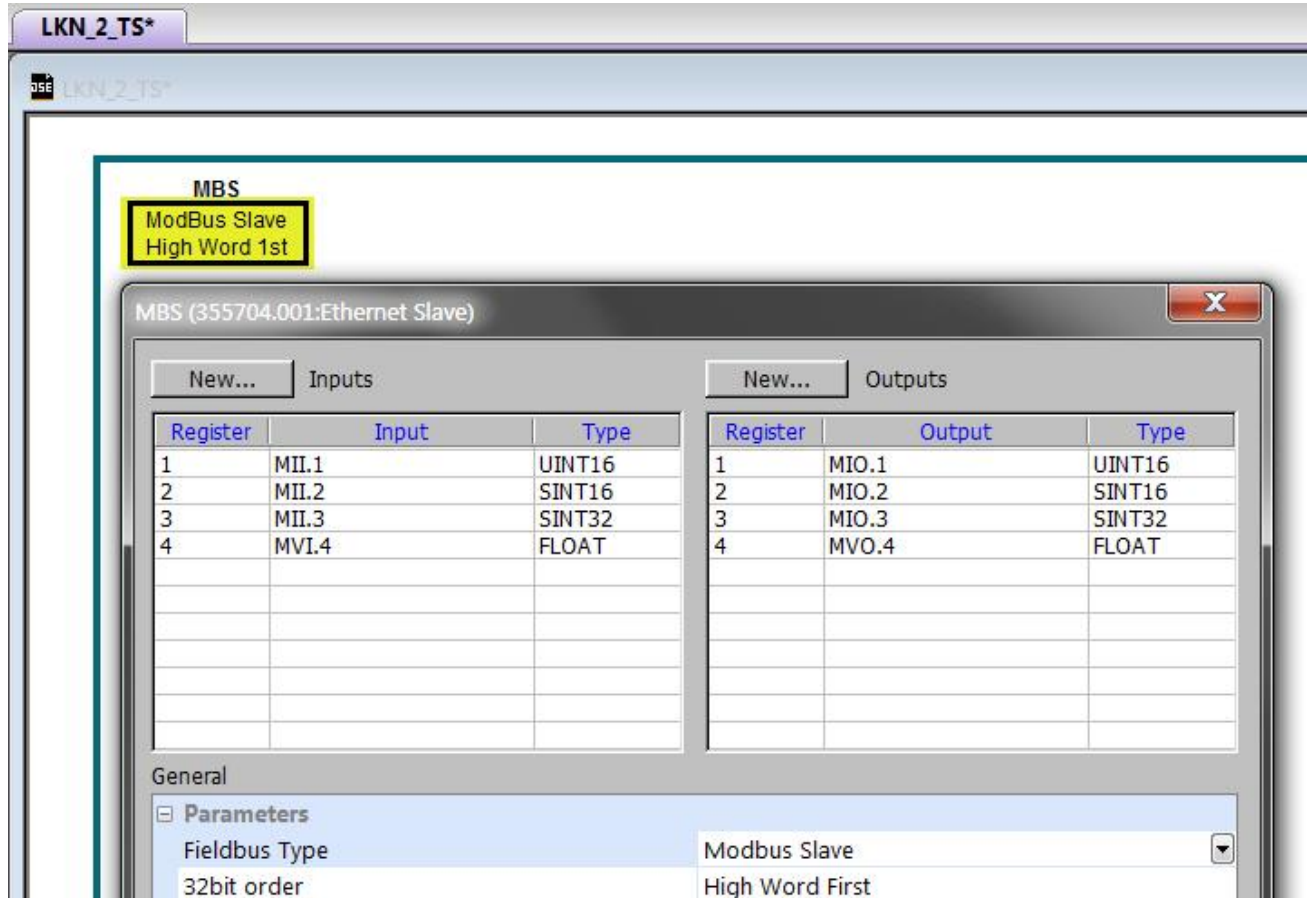


This example shows that *Integer Inputs & Outputs* were added along with a *Value Input & Output*.



Step 1.3: Configuring the Fieldbus Connectors

Double-click on the function block to display the dialog below. The fieldbus connectors (inputs and outputs) are assignable in the function block along with their data type to/from the TS8000



“32bit order” is set to “High Word First”. This refers to how 32-bit data types, i.e. SINT32, UINT32 and FLOAT are encoded on Ethernet.

- **Low Word First** is sometimes referred to as “Modicon Mode” and is used when the least significant 16-bits are sent in a lower register number than the most significant 16-bits, i.e. Little-endian.
- **High Word First** is sometimes referred to as “IEEE Mode” and is used when the most significant 16-bits are sent in a lower register number than the least significant 16-bits, i.e. Big-endian. This mode must be selected when connecting to the TS8000 HMI.

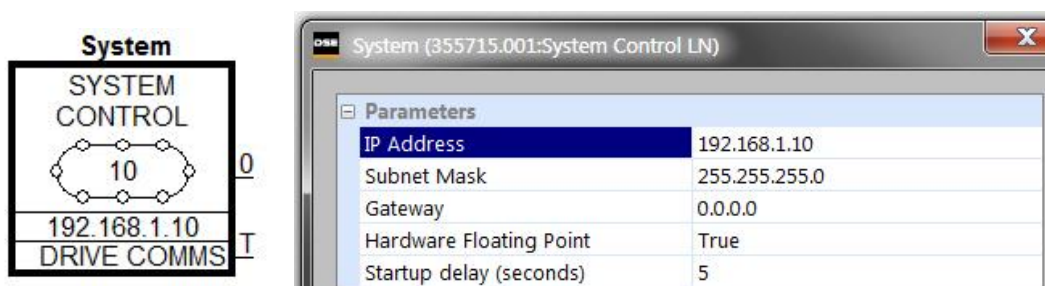
DSE Data Types

Data Type	Description	Range
LOGIC	Logic	False (F) and True (T)
INTEGER	32-bit signed integer	-2,147,483,648 to 2,147,483,647
VALUE	32-bit fixed point value	-32768.0 to 32767.9999

Ethernet Data Types

Data Type	Description	Range	Bytes Used
SINT16	16-bit signed integer	-32,768 to 32,767	2
SINT32	32-bit signed integer	-2,147,438,648 to 2,147,483,647	4
UINT16	16-bit unsigned integer	0 to 65,535	2
USINT32	32-bit unsigned integer	0 to 4,294,967,295	4
FLOAT	32-bit IEEE-754 floating-point value	1.19209290e-38 to 3.4028235e+38	4

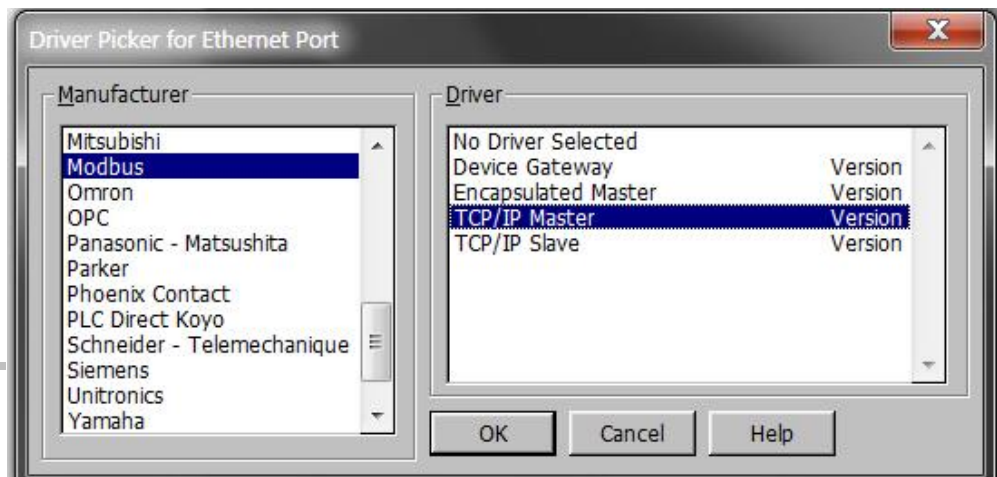
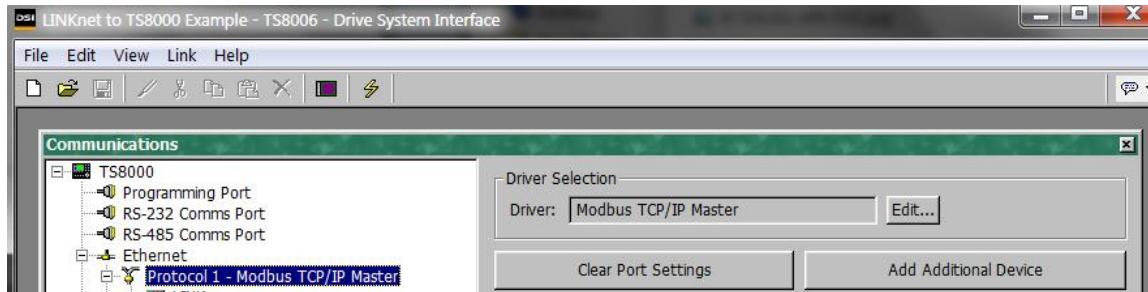
Also set up the *IP address* and the *Subnet Mask* in the *System Control* block as shown:



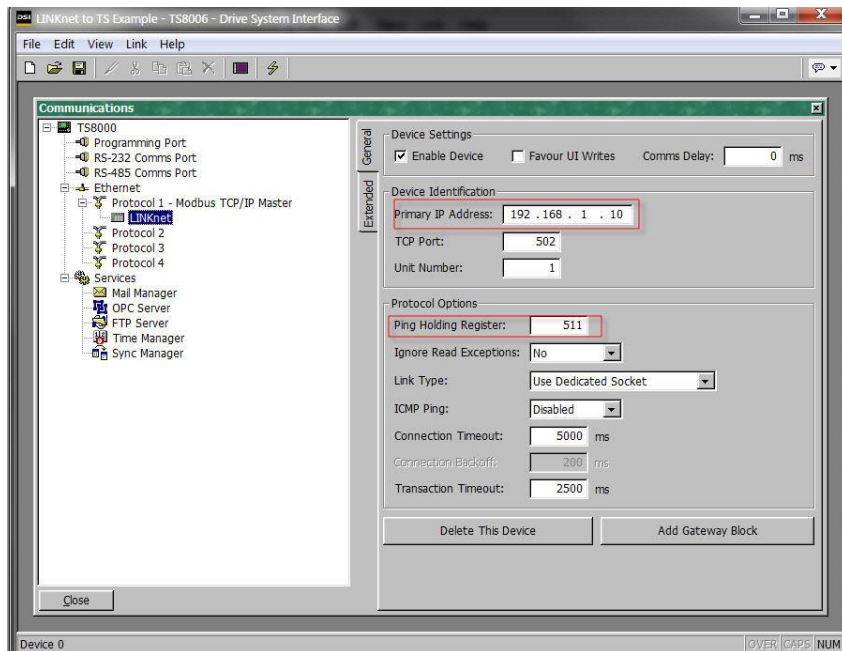
Setting up the TS8000 Operator Station using DSI8000

(The 'DSI' & 'DSE' Example discussed in this manual is located in the directory C:\SSD_LINK\HELP\WIN3. The files are called: LKN_2_TS.dsi & LKN_2_TS.LKN.)

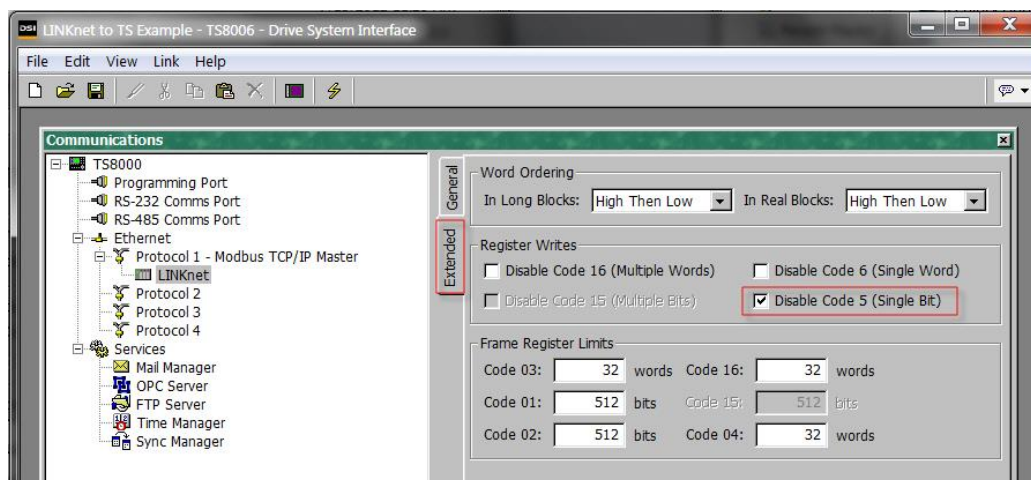
1. Select "Modbus TCP/IP Master" protocol for Ethernet Port. The TS8000 is the Master.



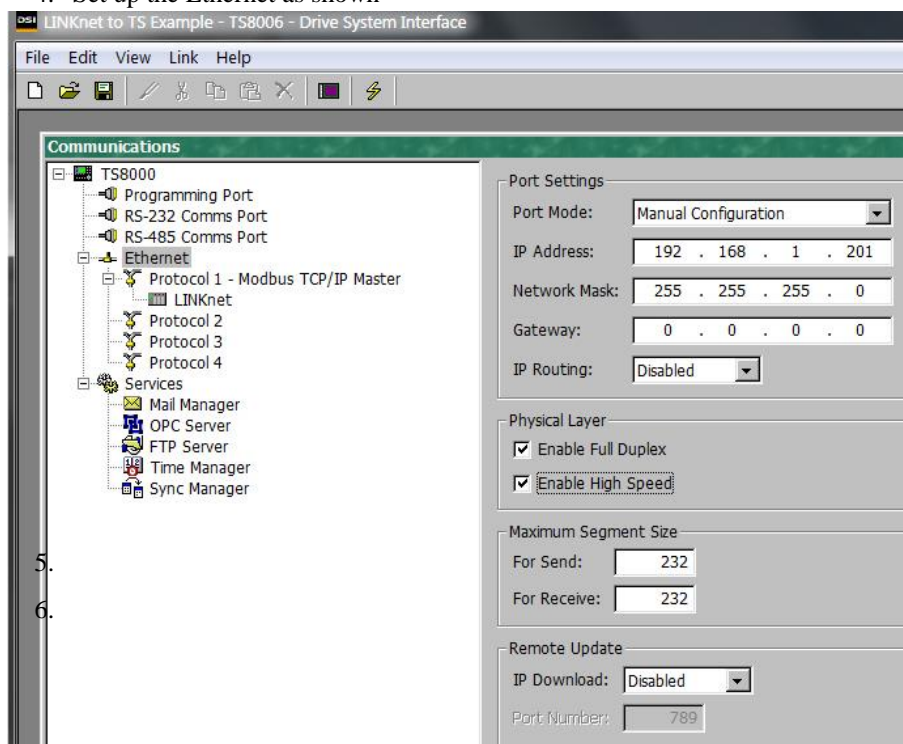
2. Set the *Primary IP Address*. The *Ping Holding Register* **MUST** be set to 511 or 0 which disables it.



3. In the *Extended* menu check the ‘Disable Code 5 (Single Bit)’’, as shown.

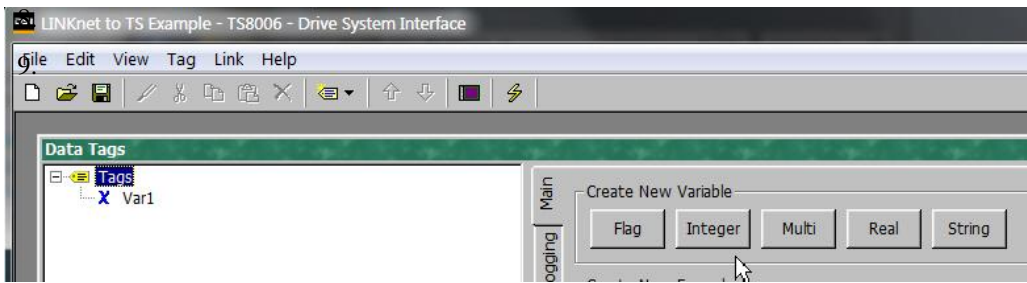


4. Set up the Ethernet as shown

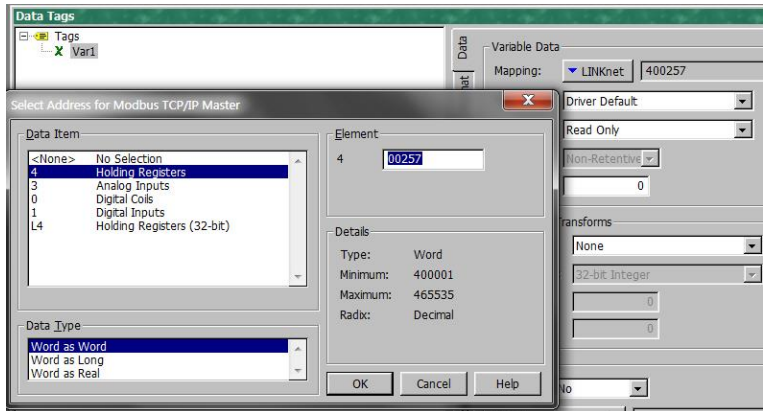


5.
6.

7. Create the Data Tags for reading and writing variables. Please see the example for pre-defined Data Tags.



8. Create the address tags. They are all pre-defined in the example.



Data Item:
Always select **Holding Registers** for both 16-bit and 32-bit data types. **DO NOT SELECT “Holding Registers (32-bit)”**.

Element:
Set to **00001** to write to the first Input variable declared in DSE.
Set to **00257** to read the first Output variable declared in DSE.
The element number then increments by 1 if the Data Type of the previous variable is **Word as Word**, otherwise it increments by 2.

Data Type:
Set as follows:

DSE Type	TS8000 Data Type
SINT16	Word as Word
UINT16	
SINT32	Word as Long
UINT32	
REAL	Word as Real

The Modbus interface is essentially the same as the 890. It on works on the holding registers (4xxxxx). Registers 400001 to 400256 are Input only (to LINKnet Techbox) and registers 400257 to 400512 are Output only (from LINKnet Techbox). There are no

read/write registers. Each register is 16 bits but two registers are used to read/write 32 bit data values via Modbus TCP/IP. Whether one or two registers are used to transmit the data depends on the Input/Output Type selected in the Modbus Slave function block. The Input/Output modbus function block selected determines the VM data format (Logic, Integer or Value) to be used to convert the VM data to the data being sent/received over modbus. Typically you would match the VM type to the Modbus type (Integer to SINT32 and Value to FLOAT), but there is no requirement to do this.

The following describes the conversion between VM inputs and how they are received via Modbus:

VM TYPE	MODBUS	# Reg	Description
Logic Input	SINT16	1	input = bit 0 of modbus register
Logic Input	UINT16	1	input = bit 0 of modbus register
Logic Input	SINT32	2	input = bit 0 of modbus register
Logic Input	UINT32	2	input = bit 0 of modbus register
Logic Input	FLOAT	2	input is 0 if input is 0.0, otherwise 1
Integer Input	SINT16	1	input = -32767 to 32767
Integer Input	UINT16	1	input = 0 to 65535
Integer Input	SINT32	2	input = -2147483647 to 2147483647
Integer Input	UINT32	2	input = 0 to 2147483647
Integer Input	FLOAT	2	input = -2147483647 to 2147483647
Value Input	SINT16	1	input = -32767.0 to 32767.0
Value Input	UINT16	1	input = -32767.0 to 32767.0 (same as SINT16)
Value Input	SINT32	2	input = -32767.0 to 32767.0
Value Input	UINT32	2	input = -32767.0 to 32767.0 (same as SINT32)
Value Input	FLOAT	2	IEEE format 32 converted to 16.16 value

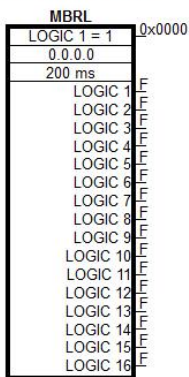
The following describes the conversion between VM outputs and how they are sent via Modbus:

VM TYPE	MODBUS	# Reg	Description
Logic Output	SINT16	1	output is 0 if input is 0, otherwise 1
Logic Output	UINT16	1	output is 0 if input is 0, otherwise 1
Logic Output	SINT32	2	output is 0 if input is 0, otherwise 1
Logic Output	UINT32	2	output is 0 if input is 0, otherwise 1
Logic Output	FLOAT	2	0.0 or 1.0 sent as an IEEE format 32 floating point number
Integer Output	SINT16	1	output clamped in range -32767 to 32767
Integer Output	UINT16	1	output clamped in range 0 to 32767
Integer Output	SINT32	2	output from -2147483647 to 2147483647
Integer Output	UINT32	2	output treated an unsigned 32 bit number (0 to 4294967295)
Integer Output	FLOAT	2	output sent as an IEEE format 32 floating point number
Value Output	SINT16	1	output clamped in range -32767 to 32767
Value Output	UINT16	1	output clamped in range 0 to 32767
Value Output	SINT32	2	output from -2147483647 to 2147483647
Value Output	UINT32	2	output treated an unsigned 32 bit number (0 to 4294967295)
Value Output	FLOAT	2	output sent as an IEEE format 32 floating point number

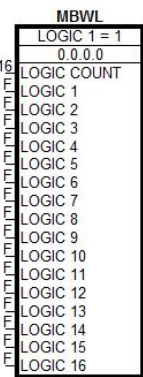
Chapter 13 - Using Remote I/O

DSE contains function blocks, which allow LINKnet to communicate to SSD
Recommended* Remote IO devices such as Analog IO and Digital IO as well as other types of hardware, which use the Modbus UDP protocol. There are function blocks in the *Block / Remote IO* menu: *Read Logics*, *Write Logics*, *Read Values* and *Write Values*. It does not matter where these hardware devices are located in the Remote IO rack when reading or writing data to these blocks. All the blocks care about is how many Digital modules there are and how many Analog modules there are.

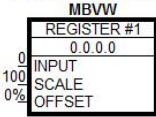
Read Logics



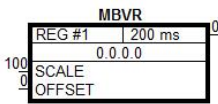
Write Logics



Value Writer



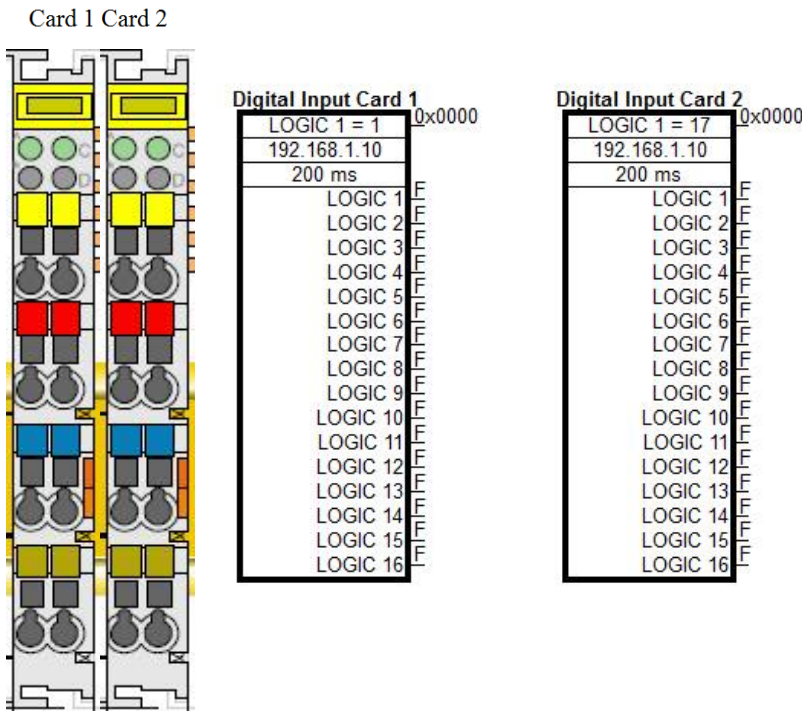
Value Reader



For example let's say there are physically 2 Digital Input cards with 16 channels each. To access the 1st Digital Input card, you will use a *Read Logics* block and set the *IP address* of the Digital Input card. *Logic 1* parameter refers to the 1st Digital Input cards channel Input 1. *Logic 16* refers to the Digital Input channel 16 of this same card. Set the *First Logic Count* to 1. This will access the 1st set of 16 Logic Channels.

Now to access the parameters on the 2nd Digital Input card channels 1 to channel 16, add a second *Read Logics* function block and set the *First Logic Count* to 17. This will access the 2nd set of 16 Logic Channels. It does not make a difference where this 2nd Digital Input card is located in the Remote IO rack, as long as it is the 2nd Digital Input card located from left to right. There can be different types of cards in between these Digital Input cards and it will not affect how these Digital Input blocks are written to, or read from. Now to access this 2nd Digital Input card, use the 2nd *Read Logics* block parameters *Logic 1* to *Logic 16*.

Example of Digital Input cards 16 Inputs each card using the *Read Logics* blocks.

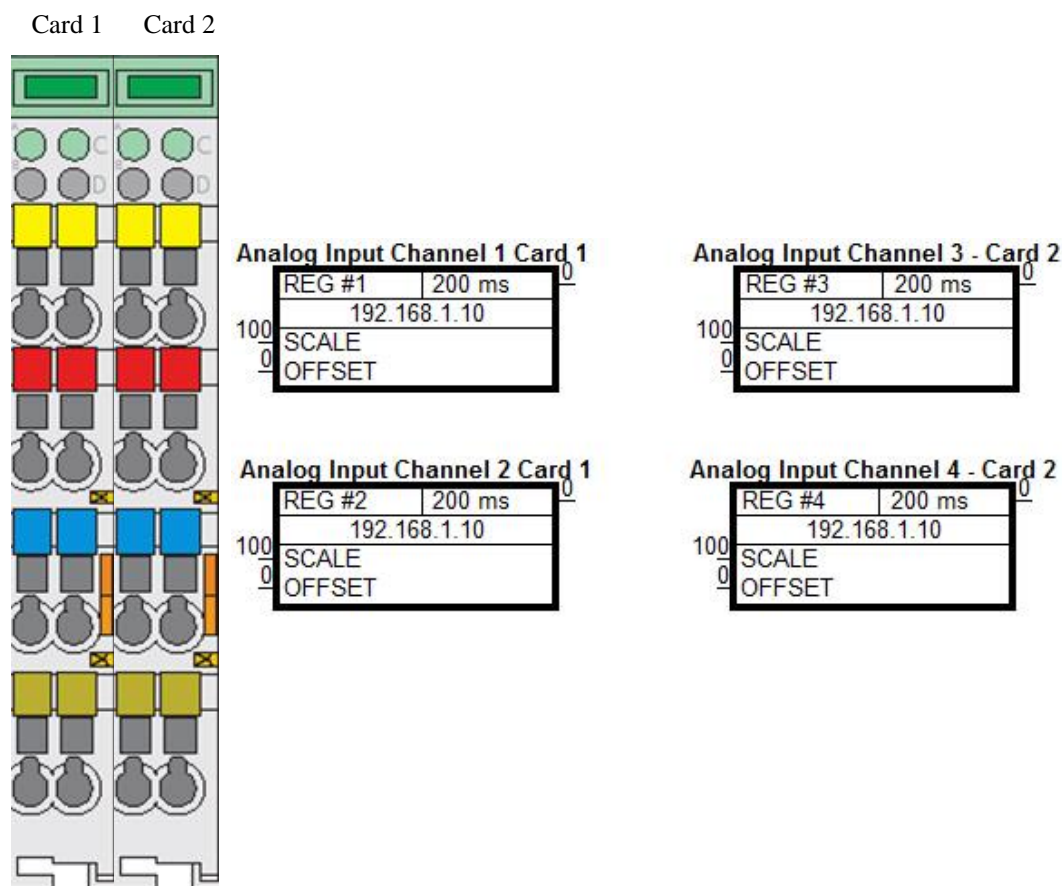


Example of 2 Digital Input 16 Channel Cards and the configuration to access these parameters using *Read Logics* blocks.

The above holds true for the *Write Logic* blocks also. It does not matter where the Digital Input or Digital Output modules are physically located in the Remote IO rack or what type of cards are installed in between these cards. All we care about is how many Digital Inputs cards there and they count from left to right.

As an example, when using Analog Input hardware modules the *Value Reader* function blocks are used to read data from these blocks. The same rules apply as above. We only care about how many Analog Input cards there are and they count from the left to right. There can be different types of cards between these Analog Input cards and they are ignored. Once the Value Reader block is placed in the configuration, enter the *Register* number. This is the hardware Analog Input location. If there are 2 Analog Inputs per module these 2 Inputs will be *Register 1* to *Register 2*. If a 2nd Analog input card is used, the Registers will be *Register 3* to *Register 4* etc.

Example of Analog Input card 2 Channels each card using the *Value Reader* blocks



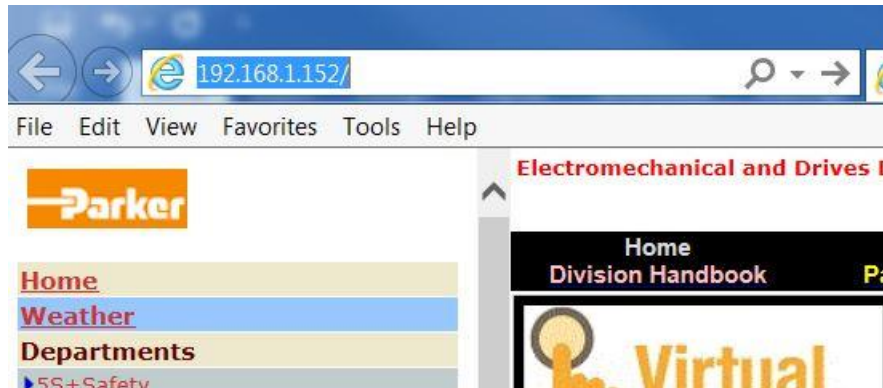
Example of 2 Analog Input 2 Channel Cards and the configuration to access these parameters using *Value Reader* blocks.

Note: If different LINKnet modules are writing data to the same IO point, the last module sending data will prevail.

Setting up Internal Watchdog on Wago I/O Coupler, 750-352

By default the internal watchdog on the Wago I/O coupler is set for an internal register that has to be set up using Modbus, and writing a specific value. There is an easier way to set up the watch dog so it will shut off all the outputs if communications are lost. The following procedure will outline the steps to follow to setup and enable the internal watch dog.

The settings for the 750-352 Wago I/O coupler can be accessed, by launching Windows explorer, and typing in the IP address. For this example, the IP address is 192.168.1.152. There needs to be an ethernet connection between the computer, and the Wago I/O coupler. Type in the IP address on the address line as follows. Then press the Enter button.



The following window should appear. On the left hand of the computer screen. Click on Watchdog.



Once you click on Watchdog, the following window will pop up for you to enter program mode on the Wago IO.



User name is admin, and Password is Wago. Now the following window should appear.

Modbus Watchdog	
State Modbus Watchdog:	Disabled
Watchdog Type :	Standard <input checked="" type="radio"/>
	Alternative <input type="radio"/>
Watchdog Timeout Value (100ms):	100
Watchdog Trigger Mask (F1 to F16):	0xFFFF
Watchdog Trigger Mask (F17 to F32):	0xFFFF

By default the Watchdog is disabled and set to standard. Click on the empty circle next to Alternative. The Watchdog timeout value is defaulted to 100, which means 100 x 100ms or 10000 msec or 10 sec. This is the time it will take to shut off the outputs once the communications have been lost to the Wago I/O coupler. Do not change the Trigger masks, they are OK at default values. Once finished click submit. It should ask for the login information again.

Now the power will need to be cycled on the Wago I/O. After the Power has been turned back on, Go back online using the Windows Explorer and make sure the Watch dog is now running. See below. Now if the Ethernet cable is unplugged or communication is lost to the Wago I/O, the watch dog will time out and all outputs will go to Zero.

NOTE: Once Communications are re-established, the Outputs will go to controlled state.

Watchdogs

page is for the configuration of the watchdogs. The configuration is stored in an EEPROM. Connection Time will take effect immediately. Changes of the Modbus Watchdog will take software or hardware reset. For more information see the manual.

Connection Watchdog

Connection Timeout Value (100ms) :

UNDO

SUBMIT

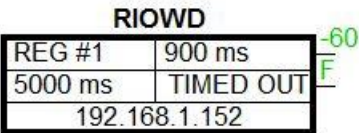
Modbus Watchdog

State Modbus Watchdog:	Running
Watchdog Type :	Standard <input type="radio"/>
	Alternative <input checked="" type="radio"/>
Watchdog Timeout Value (100ms):	<input type="text" value="100"/>
Watchdog Trigger Mask (F1 to F16):	<input type="text" value="0xFFFF"/>
Watchdog Trigger Mask (F17 to F32):	<input type="text" value="0xFFFF"/>

UNDO

SUBMIT

If it is desired to let LinkNet know if the Wago I/O coupler has stopped communication, the following DSE block can be programmed into the LinkNet node that is controlling it. It is located in the software DSE, in the menu **Block / Remote IO/Watchdog**.



The Timed output will go to True if the Wago I/O quits talking for the Set time. In This example, the watchdog timeout is 5000ms or 5 sec.

Chapter 14 – Troubleshooting

**6055-LNET-00
TECHBOX**



**6053-LNET-00
TECHBOX**



Health and Run LED's

Health and Run are drive functions and are not associated with the operation of the technology feature.

On the AC690+ frame B the Techbox is mounted in place of the keypad or blank cover. The Run and Health LED's from the keypad are replicated on the face of the Techbox. The bottom two LED indicators are for the Module (located on the right-hand side) and Network (Power On status), located on the left-hand side.





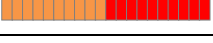








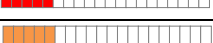

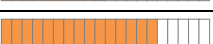
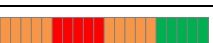
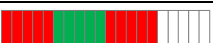
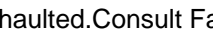
On the AC690+ frames C and above and DC590+ the Run and Health LED's are on the drive itself. Located on the TechBox are 2 LEDs that indicate the Status of the Module and the Power on.

Network (Power On LED)

This indicates that the LINKnet Technology Box Option has power applied to it.

LED STATE	FAULT	DESCRIPTION
OFF	No Power	Apply power to drive or supply external power via terminal connector TB1.
ON (Red)	None	Module has power applied to it.

Module LED Status

NCP State	Techbox State	LED Indication – 1 second period ^E	Blink Code (1second ^E)
0 Initializing	Initializing	Green 10 % : Off 90 %	
1 Halt	Config	Red 95% : Green 5%	
2 No Config	Fault	Red 50% : Off 50%	
3 L-Error	Fault	Green 50% : Red 50%	
4 H-Error	Fault	Orange 50% : Red 50%	
5 Self Test Fail	Fault	Green 50% : Orange 50%	
6 Shutdown **	Stopping	Green 30% : Orange 30% : Red 30% : Off 10% (over a 8 second period)	
7 OK	Running	Green 95% : Off 5%	
8 Power Fail disabled ** In DSE the <i>Module List Status</i> menu will show 'Low Volts'	Running	Orange 25%:Green 50%:Off 25% (a very slow blink over a 2 second period)	
9 Network Failure	Running	Green 50% : Off 50%	
A Checking Network	Starting	Green 25% : Off 75%	
B Peer Halted	Starting	Red 50% : Green 35% : Off 15%	
C Duplicate Address	Fault	Green 75% : Red 25%	
- Debugging	Fault	Red 25% : Off 75%	
- Identify USB power *	Running	Orange 25% : Off 75%	
- Identify drive power *	Running	Orange 50% : Off 50%	
- Identify External power *	Running	Orange 75% : Off 25%	
- Hardware Initialization	Fault	Orange 25:Red 25:Orange 25:Green 25	
- Hardware Fault	Fault	Red 25:Green 25:Red 25:Off 25	
The Status LED should always be blinking. If it is off or on any solid color, the processor has halted.Consult Factory			
*When using DSE and a COMMAND / IDENTIFY is performed, the LED will flash at this Blink Code indicating where the Techbox power is coming from, either the USB port, drive power or External power.			
** To clear this fault all power must be removed from the Techbox and the USB cable must be disconnected from the Techbox. Also the persistent data will not get saved on a power down.			
^E LED blink duration is 1 second, except as noted			

NCP State	Meaning / Action
0 Initializing	Upon applying power to the Techbox it will Initialize for the first 2 seconds
1 Halt	DSE requested a Halt
2 No Config	No valid configuration; install configuration
3 L-Error	Low level error; review configuration, perform Command / Get Info using DSE
4 H-Error	High level error; reinstall configuration, perform Command / Get Info using DSE . Indicates a problem with a function block
5 Self Test Fail	One or more self tests failed. Replace module
6 Shutdown – 8 sec peroid Boot mode - 1 s peroid	The module fell below the required 4.7 DC volts, but not low enough to shut off. To clear this fault all power must be removed from the Techbox and the USB cable must be disconnected from the Techbox. If the blink code is over a 1 second period , the module is in the 'Boot" Mode.
7 OK	Module is running OK, application running, network OK
8 Power Fail disabled In DSE the <i>Module List</i> the <i>Status</i> menu will show ' Low Volts	To clear this fault all power must be removed from the Techbox and the USB cable must be disconnected from the Techbox. The internal power supply dropped below 4.65 volts DC. Also the persistent data will not get saved on a power down. Thus on power up, the data loaded into the drive will be from the last time a Parameter Save was performed or a configuration was installed.
9 Network Failure	The Techbox only sees itself (1 node) on the network.
A Checking Network	On power up the module will go thru this state.
B Peer Halted	On power up the module will be Peer Halted until the other modules identify themselves on the network.
C Duplicate Address	The module found duplicates of its configured address in other module(s) on the network
- Debugging	Not used at this time.
- Identify USB power	When using DSE and a COMMAND / IDENTIFY is performed, the LED will flash at this Blink Code indicating where the Techbox power is coming from
- Identify drive power	When using DSE and a COMMAND / IDENTIFY is performed, the LED will flash at this Blink Code indicating where the Techbox power is coming from
- Identify External power	When using DSE and a COMMAND / IDENTIFY is performed, the LED will flash at this Blink Code indicating where the Techbox power is coming from
- Hardware Initialization	This is the first state the module goes thru on power up.
- Hardware Fault	Hardware fault. Replace module

Chapter 15 – Compliance

- * Recommended Ferrite Core for Ethernet cable to meet CE EMC radiated emission (Ferrite Core, Parker part number **DJ467799**).
- * The Ferrite Core and CAT 6 shielded Cable are needed to meet Class A limits of standard EN 61800-3:2004

6055-LNET-00 TECHBOX with FERRITE CORE Installed



Chapter 16 - Technical Specifications & Performance

Environmental

Operating Temperature: 0°C to 45°C (32°F to 113°F)

Humidity: Maximum 85% relative humidity at 40°C (114°F)
Non-condensing environment

Supply

Supply Voltage: Internal power supply is taken from the drive
But it can be supplied externally

External Supply

Voltage Range: 15 to 30 VDC nominal

Current draw: 320 mA @ 15 VDC
200 mA @ 24 VDC
160 mA @ 30 VDC

The inrush for LinkNet module is 16 A peak (50 mS).
Here is how the inrush data stacked up:

External Voltage (V)	Peak Inrush Current (A)
15	10
20	14
24	16
25	17
30	19

Physical

Height: 5 inches
Width: 3 inches
Depth: 1 inch
Weight: 0.2 pounds

Performance

- A LINKnet TechBox has about the same configuration capacity as a Link 2 Techbox.
- With no Application data installed into the LINKnet TB:
 - A LINKnet module can process approximately 10,000 messages / second.
 - A Link 2 module can process approximately 1000 messages / second.
 - A 890 Drive can process approximately 2000 messages / second.
- Buss Speed:
 - A LINKnet module is Ethernet based with a buss speed of 100 Mbps.
 - A Link 2 fiber Optic module operates at 2.6 Mbps.
 - Just because the buss speed is faster in LINKnet, it doesn't mean that the data can be sent that fast. It has to be processed first and then sent.

Chapter 17 - Recommended Auxiliary Products

Remote IO:

We recommend the following: Wago Series 750 products:

- 750-352 Ethernet Fieldbus Coupler
- 750-600 End Module -Terminator
- 750-601 Power Supply Module 24 V DC, Fused
- 750-430 Digital Input Module 8 Channel DC 24 V
- 750-530 Digital Output Module 8 Channel DC 24 V
- 750-457 Analog Input Module 4 Channel $\pm 10\text{V}/0-10\text{V}$
- 750-557 Analog Output Module 4 Channel $\pm 10\text{V}/0-10\text{V}$

Unmanaged Ethernet switches:

N-Tron

Hirschman

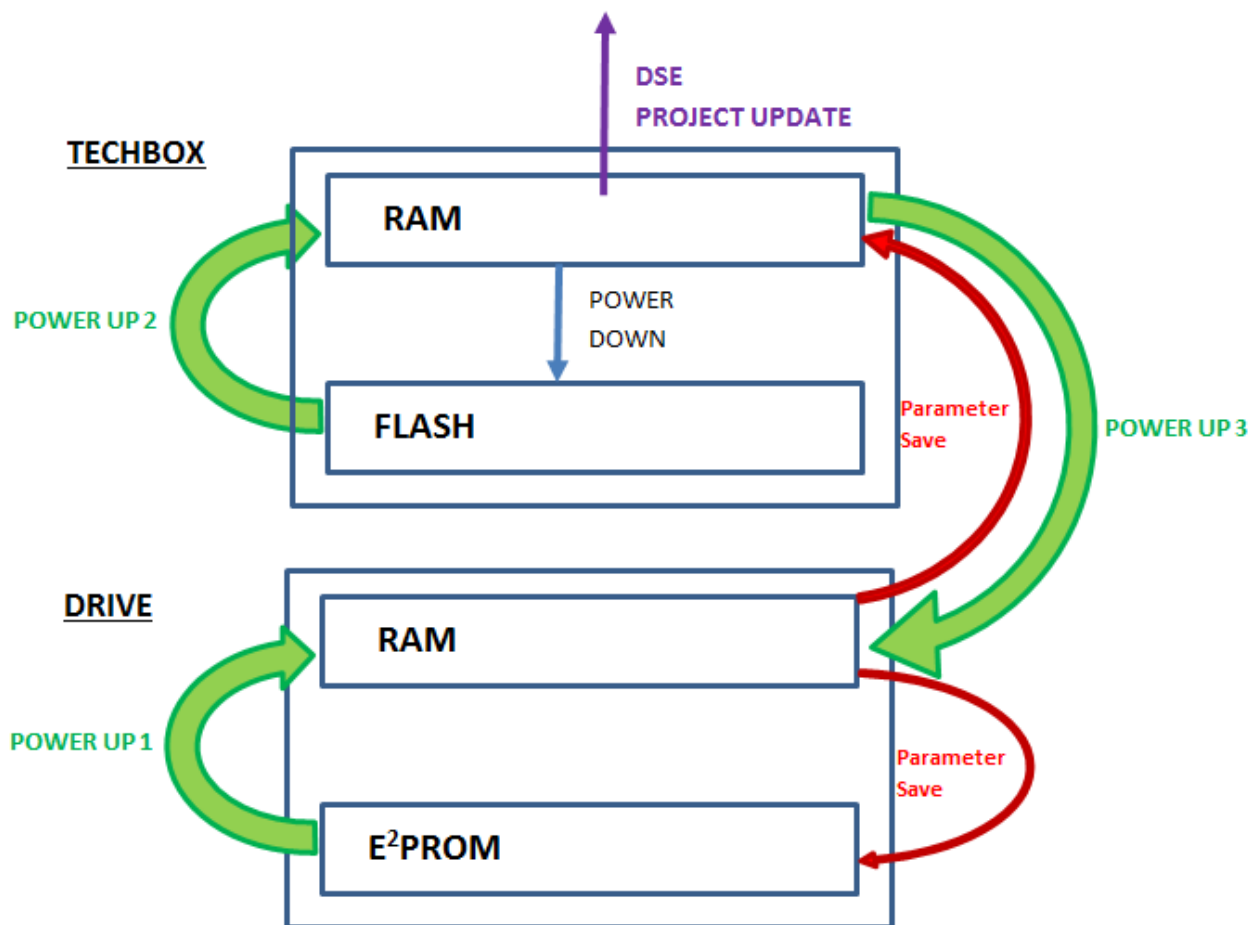
Wago: SSD part number DV471068U003 for a 5 Port

SSD part number DV471068U005 for a 8 Port

Other Communication networks:

Anybus X-Gateway Modbus TCP Master Gateway

Appendix A - Sequencing States



On Power Up the sequence is as follows:

1. When the drive is powered up, data is transferred from the *Drives E Squared PROM* to the *Drives RAM*.
2. Then data is transferred from the *Techbox's Flash* to the *Techbox's RAM*.
3. The last step is: data is transferred from the *Techbox's RAM* to the *Drives RAM*.

On a "Drive Parameter Save" the sequence is as follows:

1. Data is transferred from the *Drives RAM* to the *Drives E Squared PROM*.
2. Data is transferred from the *Drives RAM* to the *Techbox's RAM*.

On a "DSE / Project / Update" the sequence is as follows:

1. When using DSE and a *Project / Update* is performed, data taken from the *Techbox's RAM* and the *LINK Configurations* are updated. This is why a *Parameter Save* MUST be done prior to doing a *Project / Update*. If a *Parameter Save* is not performed, the *LINK Configurations* will not be updated with the drives latest parameters.

On a Power down:

1. Data is transferred from the *Techbox's RAM* to the *Techbox's FLASH*.

Appendix B - LINKnet TB Firmware Release Notes

LINKnet Techbox firmware version 1.7

Any of the **Remote IO | Read and Reader** blocks did not correctly read the parameters. This was fixed. This broke in version 1.6

Fixed an issue where there may be random loss of communications between modules.

Fixed an issue where the **Node Count** block may not update properly.

Corrected some initialization issues with Ethernet IP. Could cause a L Error.

Reading Modbus inputs registers is now supported.

LINKnet Techbox firmware version 1.6

Added support for: Up to 3 active Modbus TCP/IP connections are now supported per LINKnet module, multiple Masters may work but it will require more overhead.

Fixed an issue where the processor would halt and the Status LED would be on a solid color, when the accumulated Ethernet messages being sent out of a module, exceeded 2 billion (2^{31}). The processor could be reset by cycling power to the LINKnet module.

Fixed an issue when using the 590+ version 5 drive firmware, the Techbox interface would lose communications with the drive. This has been resolved.

Fixed an issue when the PLC software *RSLink* and the associated *Ethernet driver* would lock up the Techbox when the PLC software was launched. This has been fixed.

Added 16 bit unsigned and 32-bit signed support for Modbus Master.

Fixed a converting rounding error which occurred when VM negative Values were being written to a 590+ Native Drive parameter. A Value of 0.1 was added to the last decimal. Thus, a VM Value of -200.00% was actually -200.01% in the Drive Native parameter.

When using a 590+ v5 drive firmware and a *Command / Update* is done, a warning box appears stating 'Parameters have not been saved from keypad in the drive. Drive parameters will not be updated until 'Save Config' is done. If you continue only VM parameters will be updated. Do you want to continue?'. This warning will no longer appear.

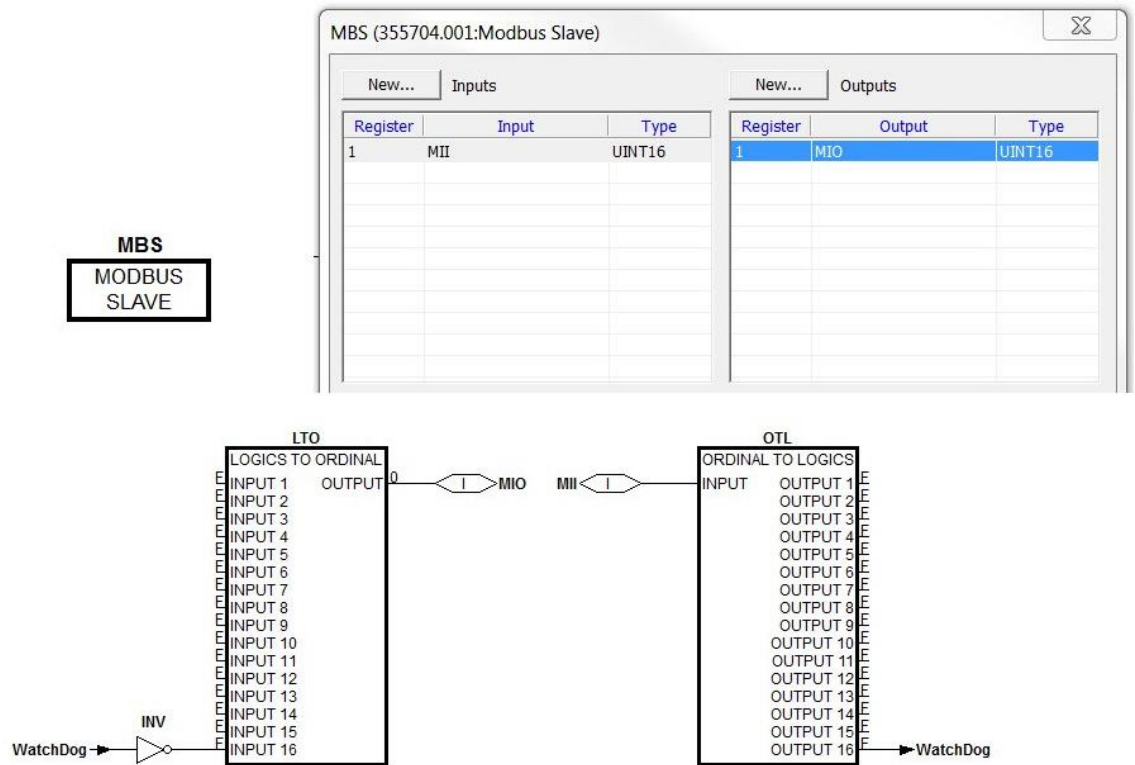
LINKnet firmware version 1.5

Added EtherNet IP Server (slave) protocol. (DSE version 3.03 is recommended)

LINKnet firmware version 1.4

With the release of LINKnet Firmware 1.4 there have been some changes/fixes to the Modbus TCP/IP, 16 bit integer data types.

For an integer data point that is going to be broken out to 16 bits via Modbus TCPIP, the data type will now need to be set to UINT16 instead of Sint16



In Firmware 1.4, if the above is programmed and the data type is set to Sint16, all the data points will turn on if the 16th bit is on. If the data type is set for Uint16, the data points will work correctly

LINKnet firmware version 1.3

With LINKnet firmware version 1.3 (and earlier versions), the Modbus Slave/Integer Output" Function Block does not process some values properly:

If the Network (ModBus) type is UINT16:

If bit 16 of the VM value is set (doesn't matter what bits 1 thru 15 are), the value sent to the network is 0.

If the Network (ModBus) type is SINT16:

If bit 16 of the VM value is set and bits 1 thru 15 are zero (value of -32768), the value sent to the network is -32767 (bits 1 and 15 set).

Simplistically, it is best to just not use bit 16 if using the output as bit values and if using the output for a numerical value, send it as an SINT16 and make sure the number is in the range of -32767 to +32767.

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