

# Galil EPICS driver networking guide for 32bit operating systems

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## REVISION HISTORY

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| 1.0      | 27 April 2016 | Mark Clift  | Original  |
| 1.1      | 18 Oct 2016   | Mark Clift  | Add troubleshooting section<br>Revised controller configuration |
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## 1 Network topology

The network between the IOC and the Galil controllers that it communicates with should be a private network. If your system requires that the Galil controller be on an open/public network, contact Galil.

Two recommended private network topologies are shown below.

### 1.1 Half duplex mode

The older economy range of Galil controllers only support  $\frac{1}{2}$  duplex communication mode (21x3, MC8000). Some newer corporate switches are beginning to drop support for  $\frac{1}{2}$  duplex communications. In this case the “separate private network” topology is recommended and the local switch is needed to provide the required  $\frac{1}{2}$  duplex capability.

### 1.2 Separate private network

The separate private network topology requires an IOC with two network interface cards (NIC). The first IOC network card faces the main beamline network, and is used for EPICS database access. The second NIC on the IOC connects to an additional layer 2/3 switch, and uses a private subnet. All Galil controllers should be connected on the additional switch, and therefore placed on the private network.

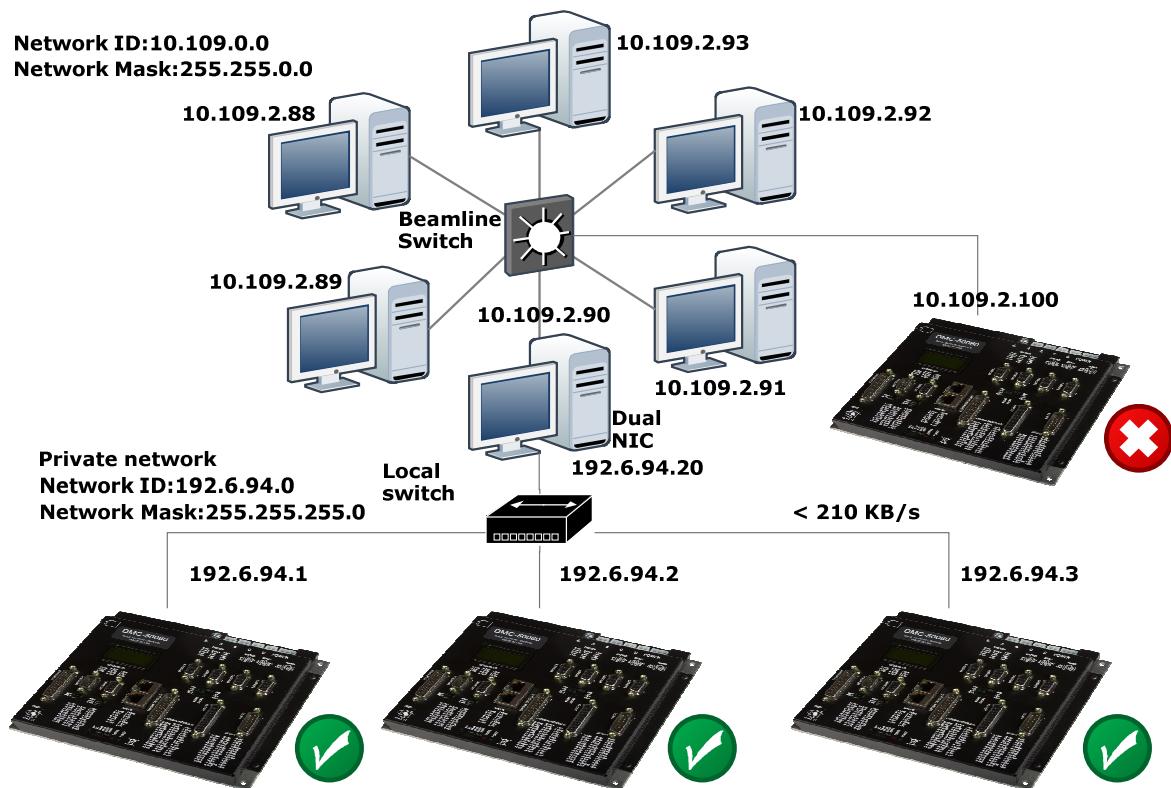


Figure 1 Separate private network

## 1.3 Configured private network

The configured private network topology requires an IOC with two network interface cards (NIC). The first IOC network card faces the main beamline network, and is used for EPICS database access. A group of ports on the main beamline switch should then be configured to be on a separate private VLAN. The IOC second NIC, and all Galil controllers should then be connected to the main beamline switch using the ports configured to be on the private VLAN.

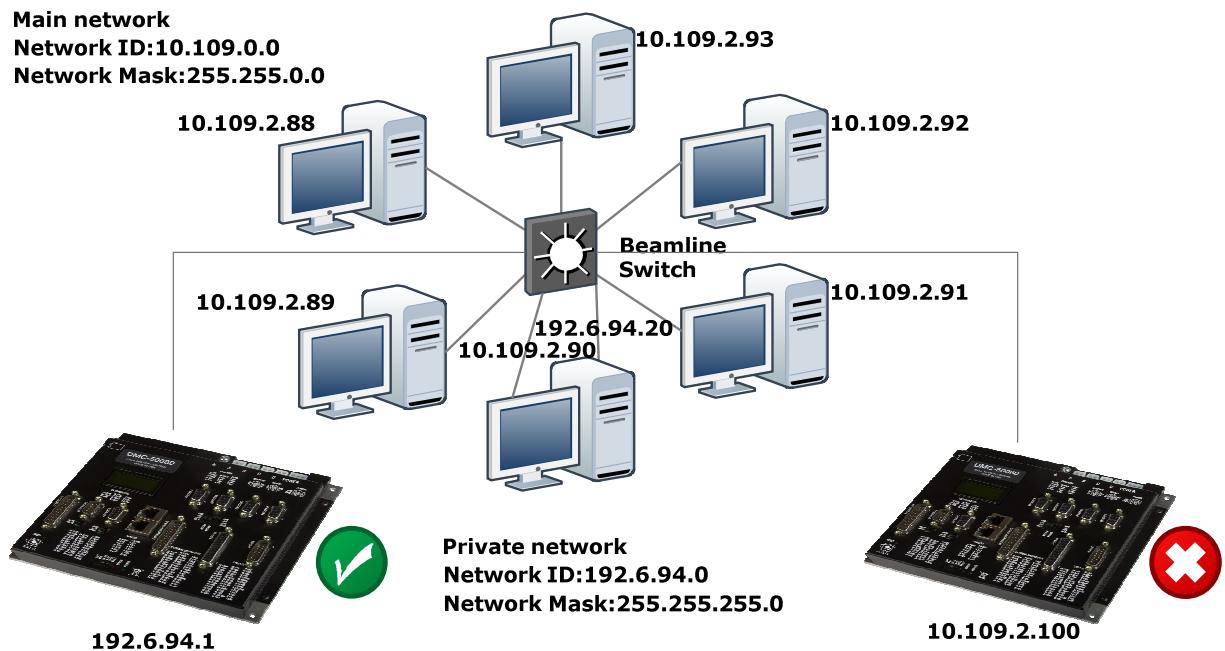


Figure 2 Configured private network

## 1.4 Open network

When the open network absolutely cannot be avoided, then the network should be configured as shown in figure 3.

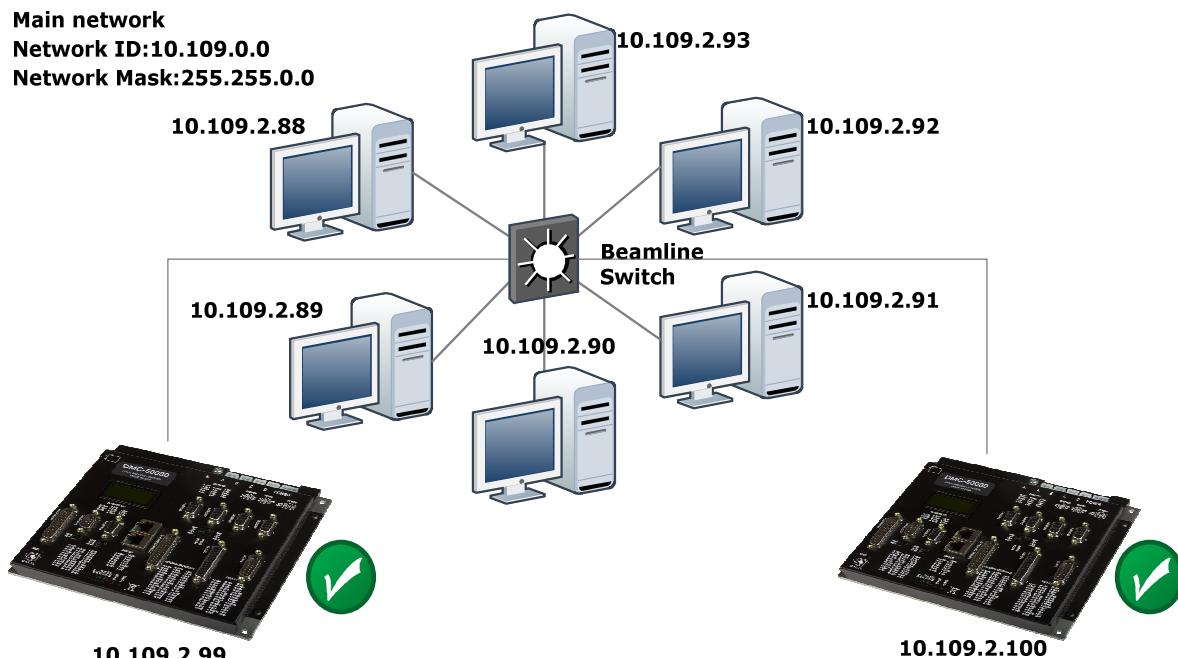


Figure 3 Open network

## 2 Controller configuration

### 2.1 Master reset

Initially do a master reset on the controller using one of the following methods:

1. Ensure no firewalls are running
2. Connect to the controller using GalilTools, and open a terminal window
3. ^R^S – Issue master reset command

Or

1. Use the master reset jumper

### 2.2 Disable DHCP

The Galil controller should use a static IP address. Newer Galil controllers have DHCP enabled at the factory, and DHCP is also enabled after a master reset. To ensure DHCP is disabled complete the following steps.

1. Ensure no firewalls running
2. Attempt to connect to the controller using GalilTools
3. If a connection cannot be established complete section 2.3, then return to step 2 above.
4. DH0 – Issue DH0 command to disable DHCP
5. BN – Issue burn command only if connection still active after step 4.

### 2.3 Assigning a static IP address

To assign a static IP address, complete the following steps.

1. Ensure no firewalls running
2. Ensure the computer host with GalilTools installed has an IP address on the same subnet as the address that will be given to the controller
3. Load GalilTools, and click on the + symbol in the toolbar
4. Search for controllers with no IP address
5. Assign a static IP address

IP address is burnt to controller EEPROM automatically.

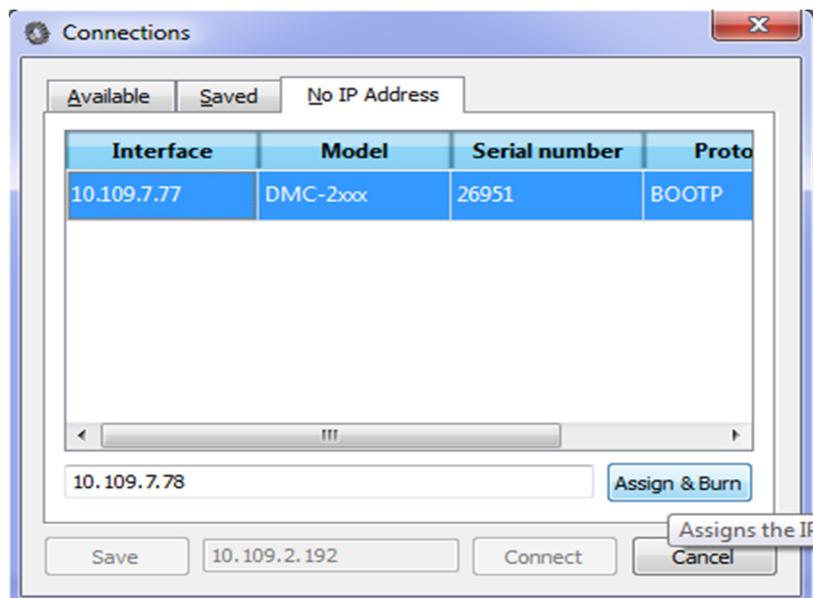


Figure 4 Assign IP address

## 2.4 Broadcast traffic

If the open network installation cannot be avoided, and the controller displays connection dropouts, then it's strongly recommended to configure the Galil controller to block network broadcasts, and arp requests.

To block broadcast and arp traffic, follow these steps

1. Ensure no firewalls are running
2. Connect to controller using GalilTools, and open a terminal window
3. TH – TH command, and record the controller MAC address
4. IB1 – Block all broadcast traffic
5. BN – Burn settings
6. Add a static arp entry on the IOC host using: arp -s <ip address> <mac address>

It's recommended that the static arp entry be added to the IOC host start-up script, so the arp entry is added at boot time. After completing this procedure, only the operating systems with the static arp entry will be able to connect to the controller.

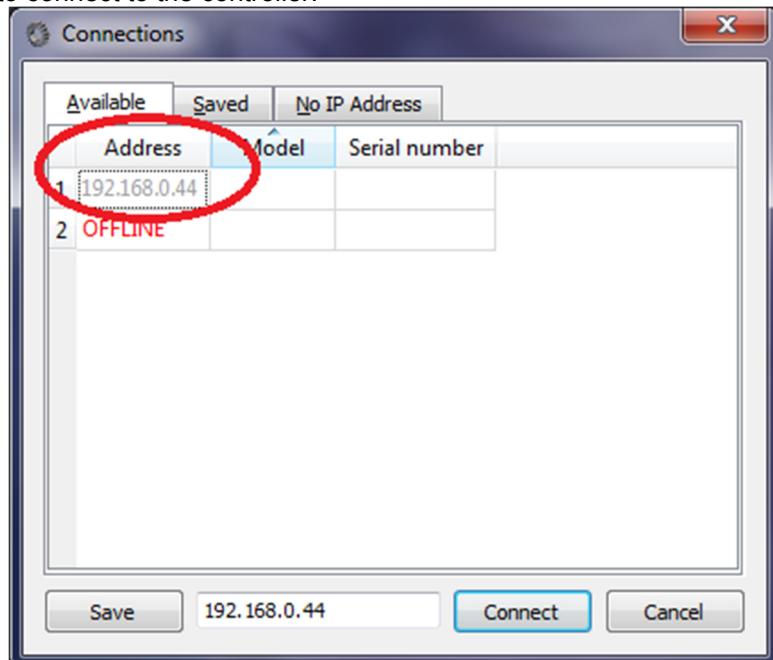


Figure 5 Controller blocking broadcast traffic, and arp requests

To again allow broadcast traffic, and arp requests, follow these steps

1. Ensure no firewalls are running
  2. Connect to controller using GalilTools from a host that has the static arp entry
  3. Issue IB0 – Allow broadcast traffic
  4. BN – Burn settings
- Or
1. Use master reset jumper

## 2.5 Block ports

If the controller displays network connection dropouts, then configuring the controller to block most ports below 1000 may help. To block ports below 1000, complete the following steps:

1. Ensure no firewalls running

2. Connect to controller using GalilTools
3. IK1 – Block most ports below 1000
4. BN – Burn settings

Use IK0 to stop blocking ports below 1000.

## 3 Troubleshooting

### 3.1 Cannot connect

1. Ensure the host with GalilTools has an IP address on the same subnet as the controller
2. Ensure no firewall is between the host, and Galil controller
3. Controller maybe configured to block broadcasts. Add an arp rule using procedure in 2.4
4. Use master reset jumper on controller

### 3.2 Connection dropouts due to controller lockup

Lockup is characterized by the controller “disappearing” off the network. Also, the error LED often illuminates. The controller must be power cycled before it’s responsive again.

Actions that should reduce occurrences are:

1. Use a separate, or configured private network
2. Configure controller to block broadcasts using procedure in 2.4
3. Update controller firmware

### 3.3 Connection dropouts

1. Use a separate, or configured private network
2. Configure controller to block broadcasts using procedure in 2.4
3. Initialise motor commutation at controller power on only. Don’t initialise commutation at EPICS driver start
4. Update controller firmware