OpenCPN Garmin Radar Plugin

Hardware Interface

The Garmin Radar PlugIn for OpenCPN requires a specific hardware interface in order to allow the OpenCPN application to access the Ethernet data captured and broadcast by the radar scanner. There are three interconnect scenarios possible, depending upon whether the installation includes an existing Garmin chartplotter, and the operational mode desired.

Interface Type 0: OpenCPN Slave Mode, using existing Garmin chartplotter.

This is the simplest interface option. In this scenario, the installation includes an existing Garmin chartplotter interfaced to the radar scanner. The OpenCPN computer is connected by means of an Ethernet patch cable to a free port on the rear face of the chartplotter. Operationally, the chartplotter and OpenCPN computer share access to the radar scanner data. However, the chartplotter is the “master” in this case, and the OpenCPN computer is the “slave”. All control of range, gain, etc is done by the chartplotter. The OpenCPN computer simply captures the Ethernet scanner data is it appears, and displays the scan data appropriately scaled to the viewport shown on the OpenCPN computer. As might be expected, overall OpenCPN system performance and screen display quality will be suboptimal in this case.

Interface Type 1: OpenCPN Master Mode, using existing Garmin chartplotter.

In this scenario, the installation includes an existing Garmin chartplotter interfaced to the radar scanner. It is desired that the chartplotter and OpenCPN computer may have shared access to and control of the radar scanner. This mode will provide improved display resolution and performance, as the OpenCPN computer may directly control the radar scanner as required.

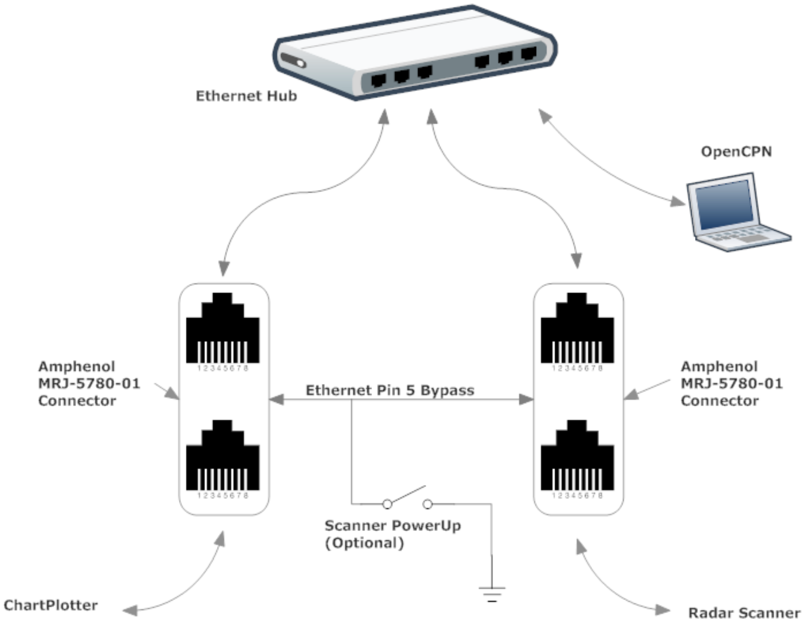
Unfortunately, the chartplotter does not echo scanner control commands appearing on its auxiliary Ethernet ports out to the scanner itself. Thus, while there may be free Ethernet ports available on the chartplotter, it is not sufficient to simply attach the OpenCPN host computer to one of these free ports if scanner control by the OpenCPN computer is desired. What is instead required is the addition of a simple Ethernet hub between the chartplotter and the radar scanner so that the OpenCPN computer may directly control the scanner as necessary, as well as capture the scanner data stream for display.

An additional complication exists. The radar scanner takes advantage of an unused pin (Pin 5) on the Ethernet cabling to manage its low power sleep mode. This functionality is provided by dedicated wiring in the Ethernet connectors on the chartplotter, and controlled by the chartplotter firmware. Unfortunately, it is not common for Ethernet hubs to pass through the required dedicated wiring pins on the cable, As a result, in an OpenCPN shared-scanner environment, we must duplicate this power control wiring externally. Finally, we may additionally wish to implement a physical switch in order to control the radar scanner power independently from the chartplotter.

A suggested wiring layout for the OpenCPN Interface Type 1 is shown here.

OpenCPN Radar Scanner Interface

Type 1

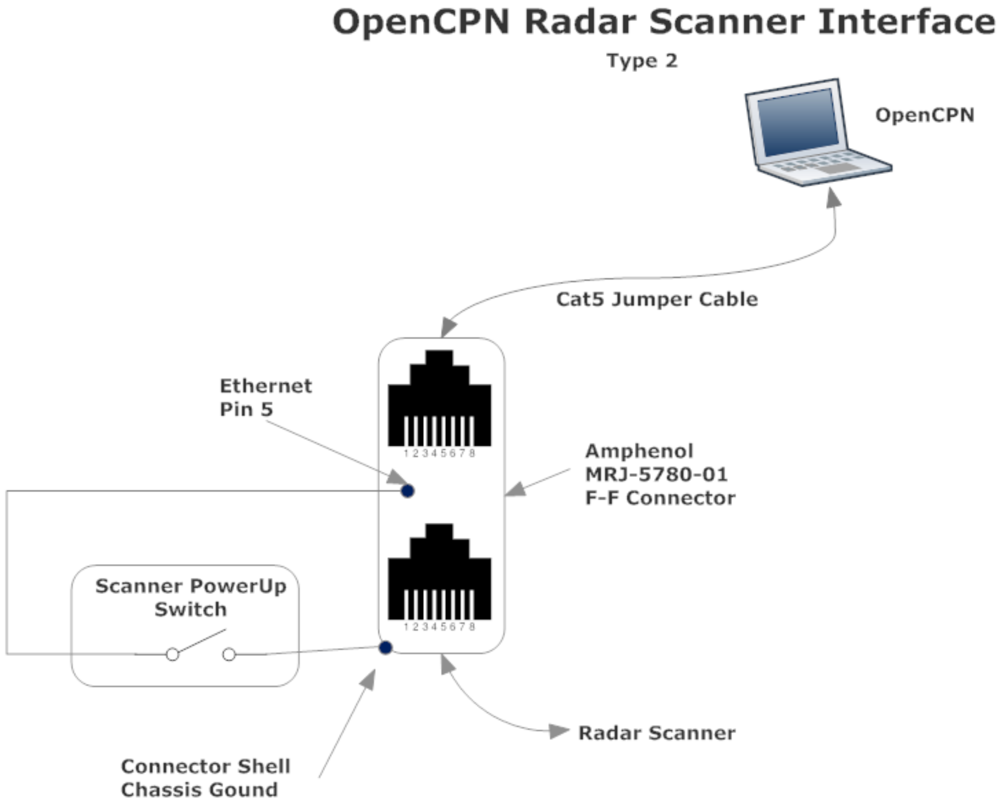


Interface Type 2: OpenCPN Master Mode, no chartplotter.

In this scenario, the installation consists only of a Garmin radar scanner and an OpenCPN computer. It is desired that the OpenCPN computer may realize full and independent control of and access to the radar scanner data.

As in the Type 1 interface, an external mechanical switch is required in order to control the power cycling to the scanner.

A suggested wiring layout for the OpenCPN Interface Type 2 is shown here.



OpenCPN Interface Notes:

1. A convenient method to access the Ethernet radar scanner power control pin (Pin5) is to use a Female-Female Ethernet adapter plug. A readily available commercial adapter is recommended, such as the Amphenol MRJ-5780-01 adapter. This particular component contains a small PC board which allows easy access to the individual Ethernet cable pins for bypass jumper and switch attachment.

   Direct link: http://www.digikey.com/product-detail/en/MRJ-5780-01/MRJ-5780-01-ND/1242671?cur=USD

OpenCPN Garmin Radar Plugin

Network Interface

The OpenCPN Garmin Radar Plugin communicates with the radar scanner by means of standard Ethernet protocols. There are two protocols of interest; a) Control packets sent from the OpenCPN computer (or attached chartplotter) to the scanner are transmitted to a specific fixed scanner address (IP) and port using UDP Datagram protocol , and b) periodic radar scan data and status reports from the radar scanner are transmitted system-wide by means of UDP Multicasting. This split of protocols is critical to the OpenCPN PlugIn, as it allow sharing of the radar scanner captured data stream. To enable this interface to the radar scanner, the OpenCPN computer must be appropriately configured for the operational mode desired.

For operation in Slave mode, there is generally no special configuration required. Linux systems must have their Ethernet port configured for MULTICAST reception, usually enabled by default. Windows systems also enable Multicast reception by default. If you happen to be running Windows as a guest under VirtualBox, you will need to enable “Bridged Networking” in the VirtualBox setting dialog for this VM.

For operation of the PlugIn in Master mode, additional configuration is required. The general idea is to configure an Ethernet port on the OpenCPN computer with an IP address belonging to the group in which the radar scanner listens and resides. This group address is hardwired into the radar scanner, and is the private (non-routable) address range 72.16.0.0/24. Formally, we may choose any specific IP address within this group for the OpenCPN computer, other than the address of the scanner or the chartplotter. Practically, the OpenCPN Radar Plugin assumes that the IP address will be set to 172.16.1.1/24.

Note that there is typically only one physical Ethernet port on the OpenCPN computer, and for most users that port is configured by the host operating system according to its needs. What we will be doing is adding another Ethernet access port in software (also known as an “alias port”), to work in parallel with the existing port(s).

For linux computers, a command line to create and enable another port is:
(assuming your base Ethernet card is called *eth1*)

```
$sudo ifconfig eth1:1 172.16.1.1 netmask 255.255.240.0 up
```

Of course, you may not want to enter this command every time you power up your computer. It is possible to edit the linux system configuration files in order to make this port creation persistent. For example, in Ubuntu you may modify */etc/network/interfaces* as follows:

```
auto eth1:1
iface eth1:1 inet static
    name Garmin special
    address 172.16.1.1
    netmask 255.255.240.0
    network 172.16.1.0
    broadcast 172.16.1.255
    gateway 172.16.1.100

ifup eth1:1
```

Other linux systems will have similar capabilities.

In Windows, it is also possible to setup alias IP addresses. For example, in Windows XP you may select

Network Adapter->Properties->TCP/IP-> Properties->Advanced

Here you may enter any additional IP addresses (aliases) as required. For the OpenCPN Radar Plugin, setup an IP of 172.16.1.1 with a subnetmask of 255.255.240.0. Note that on Windows, alias IP addresses may only be set if all static IP addresses are enabled, and DHCP auto configuration is not used. This requirement is not expected to be a limitation for shipboard computers.

Of course, if the OpenCPN computer has no other pre-existing Ethernet connections, it is sufficient to simply set the computer's main IP address statically to 172.16.1.1/24.