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1. Introduction

This quick start guide was developed to ease the use and implementation of a Moduline series embedded controller. There are a few related documents which are also described in this chapter. Information listed in this document is subjected to change. Therefore a changelog is added to this first chapter.

1.1. Related Documents

Alongside this quick start guide, there are two related documents to ease the use and implementation of a Moduline series embedded controller.

1.1.1. Moduline Embedded Controllers - Software Manual

This document, as the name suggests, offers a comprehensive software manual with all details regarding the operating system of the controllers, the dedicated services GOcontrol developed and much more.

1.1.2. Moduline Embedded Controllers - Hardware Manual

This document, as the name suggests, offers a comprehensive hardware manual with all technical details of the controllers, pinout diagrams and more.

1.2. Changelog

This changelog keeps track of changes made to this document.

Version	Date	Changes
V1.00	11-12-2023	Initial version

2. Electrical connection

2.1. Power supply

The Moduline controllers need to be powered with a supply voltage of 6-32 VDC. The controllers consume a maximum of 1.8A at 6V, so a 2A fuse is advised to protect the controller from any disturbances or short circuits. Output stages are powered separately and require additional wiring and fusing. More details about this can be found in the hardware manual.

CAUTION: CONNECTORS MAY NEVER BE HOT PLUGGED! REMOVE POWER BEFORE REMOVING OR INSTALLING CONNECTORS!

Moduline Mini I			Moduline IV			Moduline Display I		
Pin	Function	Description	Pin	Function	Description	Pin	Function	Description
B8	K30	Supply	C5	K30	Supply	A8	K30	Supply
B9	K30	Supply	C6	K30	Supply			
			C7	K30	Supply			
B33	K31	Ground	C24	K31	Ground	A33	K31	Ground
B34	K31	Ground	C25	K31	Ground	A34	K31	Ground
			C26	K31	Ground			

2.2. Enable inputs

All Moduline controllers offer at least one enable input to switch on the controller. The input needs to be pulled high to switch on the controller. A supply voltage between 6-32 VDC is required. These inputs offer voltage measurement and can therefore be used to initiate start up and/or shut down procedures in software.

Moduline Mini I			Moduline IV			Moduline Display I		
Pin	Function	Description	Pin	Function	Description	Pin	Function	Description
B17	KL15a	Enable a	C2	K15a	Enable a	A9	K15a	Enable a
			C3	K15b	Enable b			
			C4	K15c	Enable c			
Moduline Mini I								
Pin	Function	Description						
A16	KL15b	Enable b						
A17	KL15c	Enable c						

3. GOcontrol Android application

3.1. Introduction

GOcontrol developed a custom Android application for our Linux based controllers to view controller information and change controller settings on the fly over Bluetooth. The GOcontrol Android application was developed in-house with maximum ease-of-use in mind. Within the app, the user can change interface settings, access network settings, update software and module firmware and more. The application contains a built-in manual, contributing to one of the core design goals of the app; ease-of-use.

To download the GOcontrol Android application, please scan the QR code beneath or click on the google play button



3.2. Connecting to the controller

To set up a connection with a controller over Bluetooth, power on the controller and open the GOcontrol application. Scan for Bluetooth devices and hit connect. The controller will ask for a verification code, which can be entered manually, but scanning the QR code on the label of the controller is advised.

3.3. Functionality overview

3.3.1. Controller settings

In this settings menu, the controller Bluetooth name can be changed. It also contains information about the controller hardware and software

3.3.2. Controller communication/network settings

Settings of the communication/network interfaces can be changed in this menu. This includes Wi-Fi settings, WWAN settings and CAN bus settings.

3.3.3. Controller configuration/modules

This menu will give an overview of the installed modules and will show information about the module firmware. Firmware can also be updated from here.

3.3.4. Controller status/monitoring

This menu is created for future implementations.

3.3.5. Controller programs

This menu allows for enabling/disabling important services on the controller. Enabling a service here will automatically start the service, so no reboot is required. This is also implemented with disabling, the service will be stopped immediately.

4. Communication

4.1. Physical connections

All Moduline controllers are equipped with two M12 connectors, one for the ethernet connection and another one for USB or RS232. This latter is an assembly option and cannot be changed in software. The default option is USB, but if you are unsure of the configuration of your controller, please contact us.

4.1.1. USB connection

- Necessary equipment:
 - M12(B-code)-to-USB cable
 - A Laptop/PC with some kind of serial interface program like PuTTY

When a USB cable is attached between the M12 USB connector and a pc it will show up as a serial device. On Windows it should show up in device manager as a COM# port, this COM# port can then be used with a program like PuTTY to get a Linux shell over USB. The baud rate must be set to 115200. On a Linux host machine a program like screen can be used, the controller will be mounted in the /dev/serial folder.

The command to connect could be something like this:

```
sudo screen /dev/serial/by-id/usb-Linux_5.10.72+g80c3c020decd_with_dwc3-gadget_Gadget_Serial_v2.4-if00
```

The device will most likely have a slightly different version number so don't copy this command 1 for 1. instead type the command listed below and then press tab to autocomplete the command.

```
sudo screen /dev/serial
```

4.1.2. RS232 connection

- Necessary equipment:
 - M12(D-code)-to-SUBD9 cable with an RS232-to-USB converter
 - A Laptop/PC with some kind of serial interface program like PuTTY

For communication over RS232, a RS232-to-USB converter is needed to for connections to a PC or laptop. The rest of the workflow is the same as connecting through USB. In this case the RS232-to-USB converter will show up as a COM# port on windows and a /dev/serial device on Linux. However, the baud rate is now essential and should be set to 115200. For Windows this doesn't change this instructions, but for Linux a slight change has to be made to the command it should have 115200 at the end, for example:

```
/dev/serial/by-id/usb-Prolific_Technology_Inc._USB-Serial_Controller-if00-port0 115200
```

Note: your RS232 -to-USB converter will most likely have a different name so use the same autocomplete trick.

When connecting with either of these connections it might be necessary to press enter once or twice to get the login prompt to show up.

4.1.3. Ethernet connection

- Necessary equipment:
 - A M12-to-RJ45 Ethernet cable
 - Either a router, a Laptop/PC with a DHCP server or a controller equipped with the optional Bluetooth module
 - A Laptop/PC with an SSH tool, for example: PuTTY or the CMD SSH tool

- With a Router

Connect the controller to an existing network that your Computer is also connected to. Use either the GOcontrol app if the controller has a Bluetooth interface or the router's web interface to find the IP address that the controller was assigned. It can also be done using a tool like angry IP scanner on Windows or arp-scan on Linux. After the IP has been found, continue to the Login using the command line interface.

- With a personal DHCP server

To connect a controller directly to a PC or laptop, a DHCP server tool needs to be installed. An example for this would be 'Open DHCP Server', an open source DHCP tool, that is available for both Windows and Linux machines. This DHCP tool will provide the IP address to the attached controller. After connecting the controller with an ethernet cable, use a tool like 'Angry IP scanner' on Windows or 'arp-scan' on Linux to find the IP address of the controller. After the IP has been found, continue to the Login using the command line interface.

- With a static IP address

When the controller is equipped with the optional Bluetooth module, a static IP address can easily be configured in the GOcontrol Android app. An unconnected controller will show a stationary orange enclosure LED. Connect to the controller, the orange LED will now start flashing. Browse to the communication settings menu and then to the ethernet settings. Switch the controller to static IP mode and enter a desired IP address, save the changes at the top of the screen.

On Windows, the Ethernet settings need to be adjusted accordingly, the IP assignment needs to be configured as static, with a manual set IPv4 address. This IP address needs to fit within the same netmask as the configured IP address in the controller. Now connect the controller to a Laptop/PC with the ethernet cable and continue to the Login using the command line interface (CLI) page, with the IP address that was configured with the app.

4.2. Wireless connection

4.2.1. Wi-Fi connection

All Moduline controllers can be equipped with a Wi-Fi/Bluetooth module and therefore offer a Wi-Fi interface. This paragraph will guide you through connecting our Moduline controllers through Wi-Fi.

- Necessary equipment:
 - A controller equipped with a Wi-Fi/Bluetooth module
 - An existing wireless network/hotspot or a Laptop/PC capable of connecting to a Wi-Fi network

- When the controller is accessed via Wi-Fi, There are two options:
 - Controller access point
A controller equipped with a Wi-Fi/Bluetooth module will set up an access point by default, this can be disabled when it is desired. The credentials are by default:
 - SSID: GOcontroll-AP-xxxx
 - PASS: Moduline
 - Connecting to an existing Wi-Fi network or hotspot:
Connect to the controller with the GOcontroll Android app, browse to the communication settings menu and then the WLAN/Wi-Fi menu. Set the controller to Wi-Fi Receiver Mode, the page should refresh and it will show available networks in the area. If it does not yet show new networks after this refresh you can manually refresh the list of network with the refresh button at the top of the screen. Now connect with the desired network, and it will show the IP address that the device has been assigned, again this might need another refresh as it is possible that the controller has not received an IP address yet.

4.3. Software connection

Now we are going to connect to Linux, running on the controller, using PuTTY. If you haven't installed putty, you can download it here. PuTTY is a terminal program that can connect to the controller using SSH. SSH is by default enabled on the Moduline. Keep in mind that others, who have a wired or wireless connection to the controller, can also login to the system...

Open PuTTY. You only need to provide an IP address.

4.3.1. PuTTY using a wired connection

If you made a wired connection to a network, you have retrieved the DHCP IP address (Make connection with controller). Use this address in PuTTY to connect to the controller:

-your retrieved IP address-

4.3.2. PuTTY using a WLAN connection

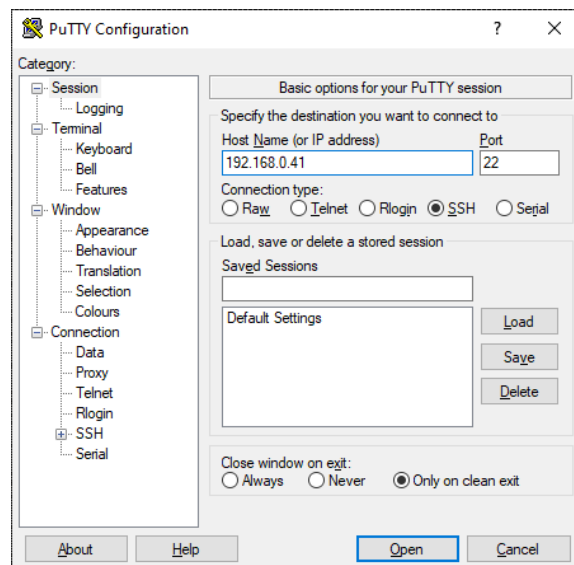
If you connect to the controller via WiFi, the controller has a fixed IP address. Connect using PuTTY with IP address:

192.168.19.85

4.3.3. PuTTY using a USB/serial

If you connect to the controller via USB or serial, select the Serial connection type from the list. Find out which COM# port the controller is registered to in device manager.

Enter the COM# in the bar at the top, set the baud rate to 115200 and click open. You might need to press enter once or twice to get the login prompt to show up.

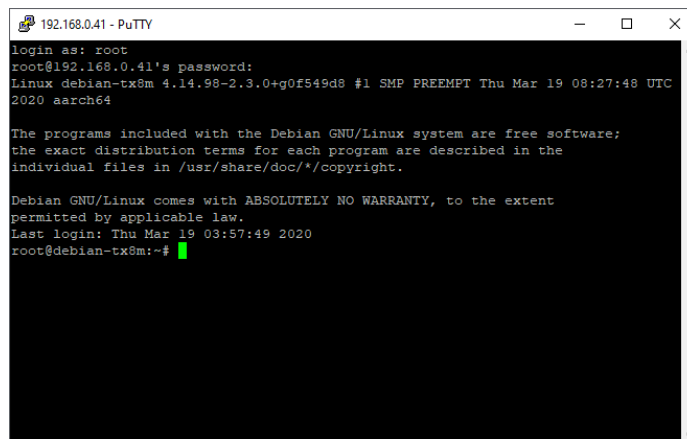


4.3.4. Linux credentials

If you are connected to Linux, you only have to login as root. By default, the credentials are:

- Login: root
- Pass: root

If the login is successful, configurations and installations can be done using the command line interface. For example changing the password with the `passwd` command.



```
192.168.0.41 - PuTTY
login as: root
root@192.168.0.41's password:
Linux debian-tx8m 4.14.98-2.3.0+g0f549d8 #1 SMP PREEMPT Thu Mar 19 08:27:48 UTC
2020 aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Mar 19 03:57:49 2020
root@debian-tx8m:~#
```

You have now reached the end of this quick start guide, for more information about the software running on the Moduline controllers, with the most common procedures, instructions and more, please download the software manual. For more information about the hardware, with all technical details, pinout diagrams and more, please download the hardware manual. These manuals can be found on our website.