QBrick Display Unit

D-Unit User Manual

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Read Me

Read this user manual carefully before installing, operating, or maintaining the QBrick Display Unit (D-Unit). Safety must be the primary consideration when reviewing all the installation guidelines specifications described in this document. Installation, operation, and maintenance of the D-Unit must be performed by qualified and trained professionals with experience in high voltage and current devices and metering equipment. Quadlogic Controls Corporation is not responsible or liable for any injuries caused by improper installation, operation, or maintenance.

De-energize and ground the D-Unit prior to any maintenance or repair.

Observe the following guidelines before installing or using the device:

1. Verify that the power supply has the necessary approvals and certifications and that it meets the specifications of the **D-Unit.**

2. Dangerous voltage levels may be exposed when the **D-Unit** terminal cover is off. Use caution when working with the **D-Unit** under these conditions.

3. Verify that all terminals for communication signals (RS-485) are protected from any line voltage or current.

4. Verify that all instrument wiring is consistent with the internal system settings and meter specifications.

5. Please keep a copy of this manual readily available.

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1. Package Contents

1 **D-Unit**

2 spare lead seal screws

1 RS-485 terminal plug

1 AUX power terminal plug

1 User manual

2 Plastic panel mounting clips

Spare Screws | AUX | Panel Mounting Clips | RS-485

2. Overview

The QBrick **D-Unit** displays real-time metering data and troubleshooting information for up to 16 QBrick meters on a single LCD screen.

3. Specifications

Working Power Supply

AC/DC 90-240 V, 60 Hz
Power consumption: <5 W

Dielectric Strength

4 kV AC RMS 1 minute, between input / output / case / power supply

Working Temperature

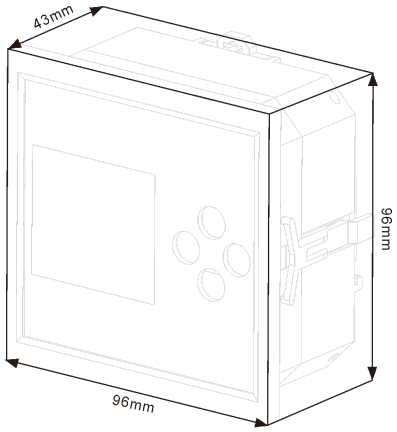
Temperature: -20 °C to +55 °C
Pollution degree: 2
Humidity: RH 0% to 95% (non condensing)
Altitude: up to 2000 m

Storage Conditions

Temperature: -25 °C to +70 °C
Humidity: RH 0% to 95% (non condensing)

Dimensions

L × H × D = 96 mm×96 mm×43 mm



Installation

35 mm DIN-rail, panel mounting, or optional NEMA box

4. Installation

This chapter contains installation instructions and wiring diagrams for **D-Unit** installations. When installing the **D-Unit,** it is critical that you use the correct wiring instructions.

Follow instructions and warnings to insure proper operation of equipment and to reduce risk of electric shock or other hazardous conditions.

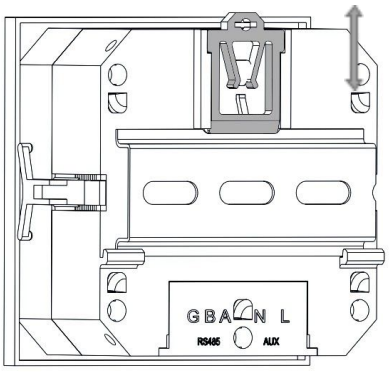
The following is an overview of the installation steps.

Installation Overview:

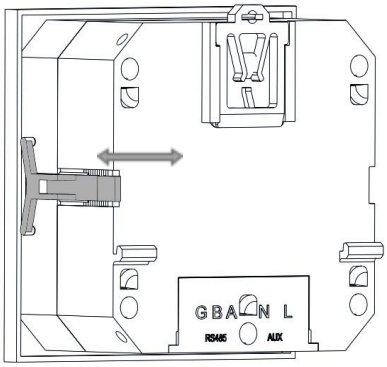
1. Mount the **D-Unit**
2. Review **D-Unit** connections diagrams
3. Connect **D-Unit** communication (RS-485/DISP) to devices
4. Connect auxiliary power inputs (V-PWR)
5. Verify wiring
6. Test the installation
7. Become familiar with the operation

4.1 Mounting the D-Unit

The **D-Unit** has two installation options. It can either be mounted on a 35 mm DIN rail or it can be installed on the front panel of a cabinet or NEMA box by using the 2 plastic panel mounting clips on the side of the **D-Unit** (see diagrams below).



Din-rail Mounting



Panel Mounting

(Same on Opposite Side)

a. DIN Rail Mounting (left diagram above)
   i. Fasten a section of 35 mm DIN rail (at least 4 inches long) to the mounting surface with appropriate hardware.
   ii. Use the white plastic clip on the back of the **D-Unit** to clip the unit onto the rail.
   iii. Verify that the **D-Unit** is securely fastened to the wall.

b. Panel Mounting (right diagram, previous page)
   i. Make a 90.5 mm x 90.5 mm (+/-0.5 mm) square cutout for the **D-Unit** in the appropriate location on the panel.
   ii. Remove the two clear panel mounting clips from the **D-Unit**.
   iii. Insert the **D-Unit** into the panel cutout so that the display faces outward.
   iv. Insert each of the panel mounting clips into the slots on the side of the **D-Unit** to secure it to the panel. Apply light pressure to lock them in place.
   v. Check that the **D-Unit** is now mounted securely to the panel.

4.2. D-Unit Wiring

4.2.1 Communication Wiring Specifications

Note: Refer to wiring diagrams for RS-485 and AUX terminal pinouts.

The **D-Unit** has one RS-485 port used to connect to QBrick DISP port terminals.

The composition of the RS-485 cabling must be shielded cable (1 twisted pair RX/TX with communication ground) with a diameter of not less than 0.5 mm^2 (suggested: 22 AWG to 14AWG). The maximum allowed distance between a QBrick and the D-Unit or repeateris 1,000 meters.
Use a cable that complies with the Electronics Industry Association (EIA) standards for RS-485 communications. Refer to RS-485 application note/wiring diagram for more information.

Wire Type	Twisted Pair
Characteristic Impedance	120 Ω
Shunt Capacitance	17pF Max
Acceptable Wire Gauges	22, 20, 18, 16, 14 AWG

4.2.2 Auxiliary Power Wiring Specifications

The D-Unit must be connected to a power source providing 90 - 240 V (AC or DC). This power voltage is connected to the AUX terminals on the D-Unit. The wiring for the AUX port can be from 20 AWG to 14 AWG. The **D-Unit** can use the same power source as the QBrick meter (the typical wiring guide shows the AUX port on the **D-Unit** and V-PWR port on the QBrick using the same power source).

4.2.3 D-Unit Wiring Instructions

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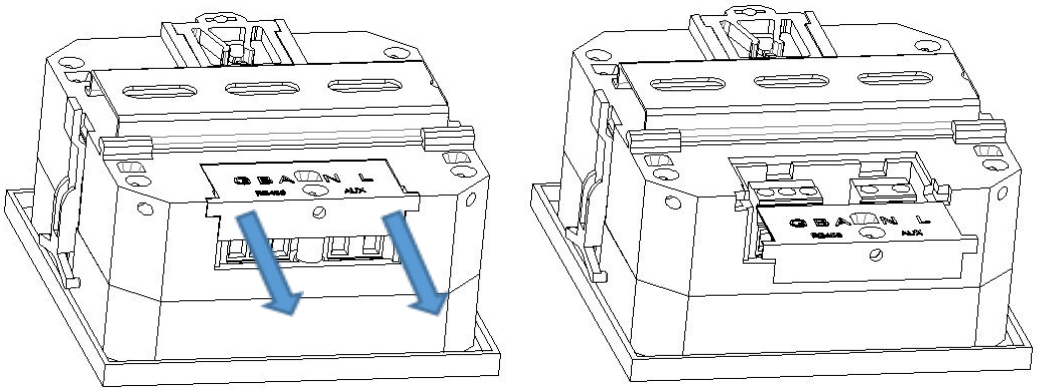
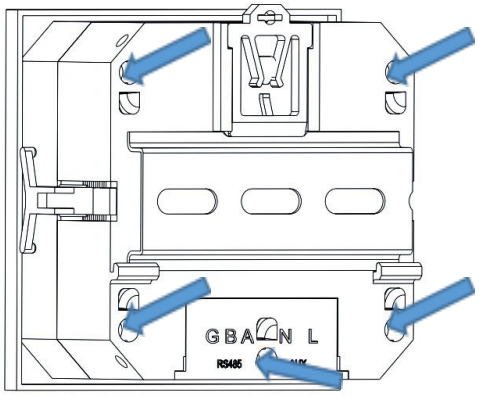
1. Turn off the power supply for the **D-Unit**
2. Remove the **D-Unit** terminal cover according to the diagram below.
3. Using the wire specified for RS-485, connect the G, B, and A terminals on the **D-Unit** to the corresponding DISP port terminals on up to 16 QBricks. Note: Use the wiring diagrams below for details on how to make the connections to multiple meters.
4. Using the wire specified for the AUX port, connect the **D-Unit** AUX port terminals to a 90-240 VAC/DC power source. You may use the same power source as the QBricks as long as the source can provide enough power for all devices.
5. Verify that the RS-485 and AUX wiring is correct.

6. Place terminal cover back on the **D-Unit**.
7. Seal the **D-Unit** (if necessary).
8. Return the **D-Unit** to its mounted position.
9. Turn the AUX power supply on.
10. Verify that the **D-Unit** turns on by observing the LCD screen.
11. Refer to the next section to verify the operation of the **D-Unit**.

To access the terminals, please remove the cover as shown below:



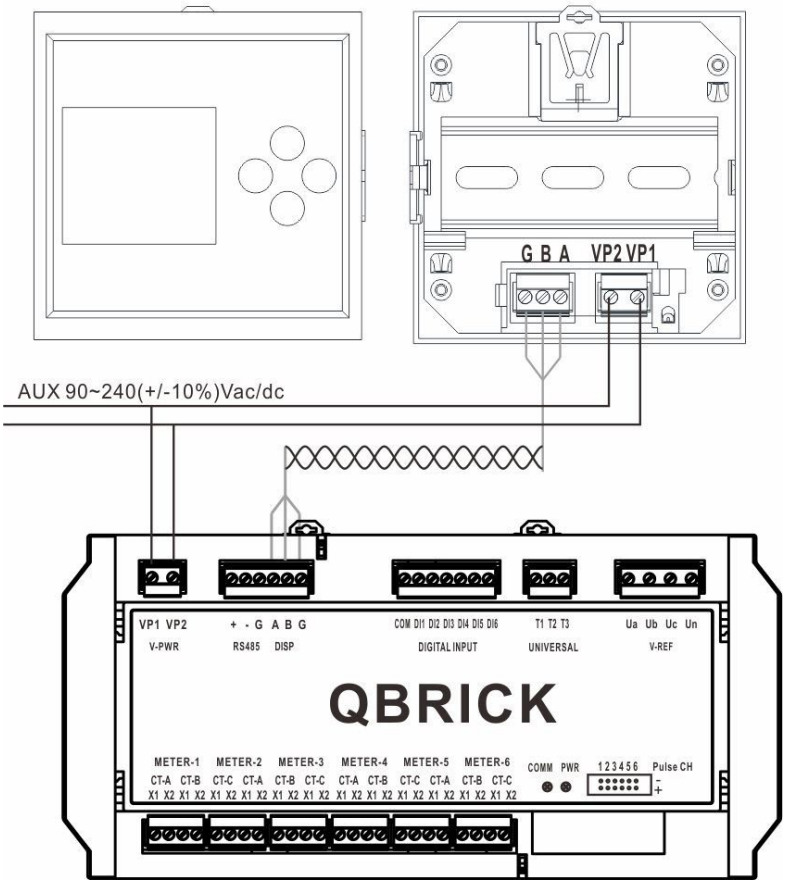
Remove screw and pull down the cover to expose terminals



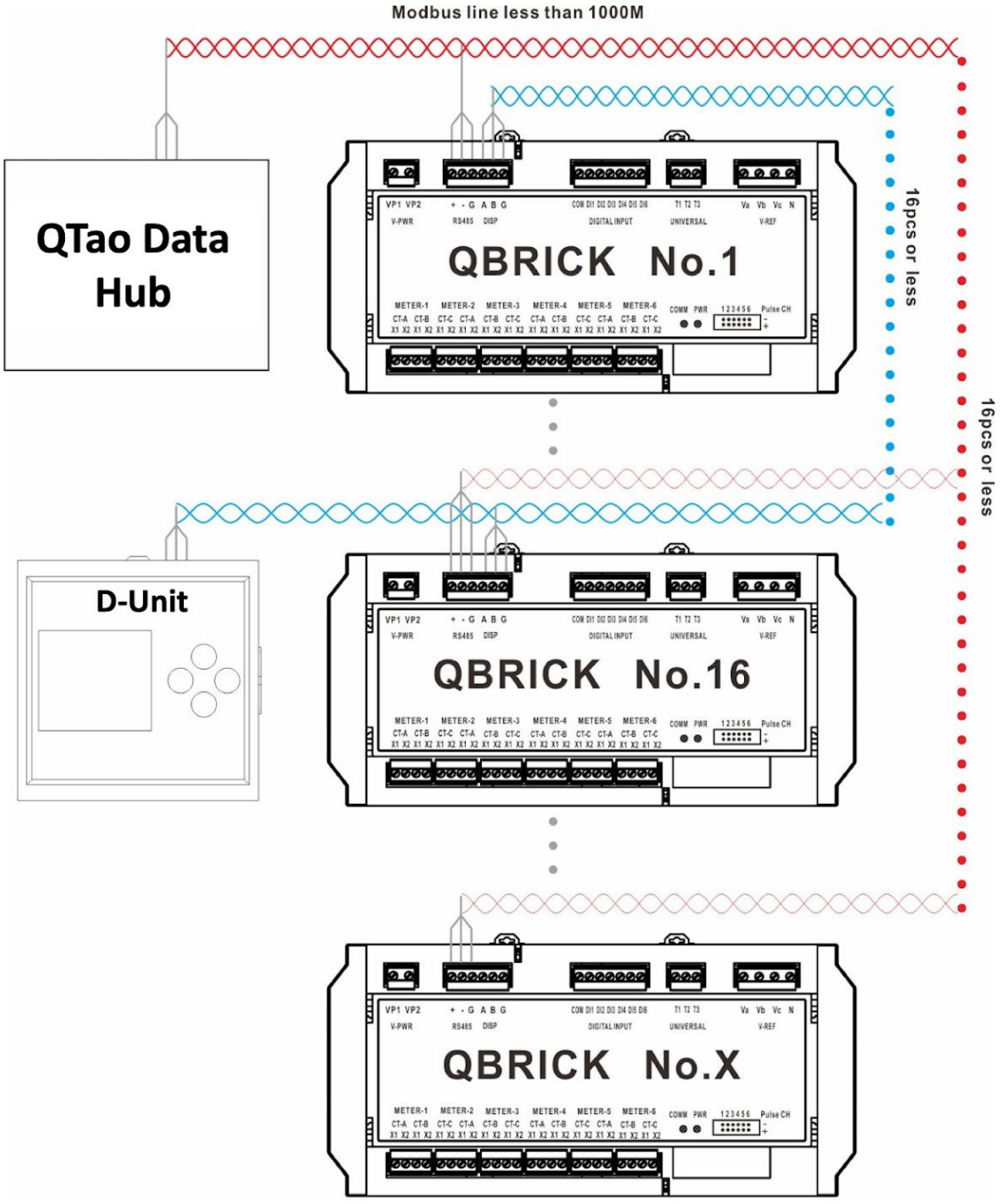
Notes: When wiring of the unit is completed, please replace the terminal cover. The cover has a lead seal hole for tamper protection.

The rear side of the **D-Unit** has five screw holes designed to accept a lead seal. Therefore, the **D-Unit** can be locked (if required) after the **D-Unit** and meter(s) have been installed.

Typical wiring of a **D-Unit** connected to a single QBrick meter



One **D-Unit** can connect to a maximum of 16 QBrick meters on the DISP port modbus network. Multiple QBricks can also connect with another MODBUS host / master device on their other RS-485 port. Please refer to the following diagram for a typical wiring example



4.3. D-Unit General Operation

Screen: The **D-Unit** has a 32 x 23 mm LCD screen that shows metering parameters collected from the QBrick. After powering up the device and connecting it to a QBrick(s), the **D-Unit** will show a "Welcome Screen" and perform a self-check.

Buttons: There are four position buttons to the right of the screen. These buttons are used to either scroll through each metering parameter display or to enter the configuration menu.

	In metering parameter display	In configuration menu
▲	Go to the previous parameter	Increment value or press and hold to enter configuration menu
▼	Go to the next parameters	Press and hold to exit configuration menu / decrement value
◀	Select previous QBrick device / display previous parameter	Go to the previous page / move the cursor
▶	Select next QBrick device / display next parameter	Go to the next page / move the cursor

4.4. D-Unit configuration

After commissioning of the metering system and **D-Unit** has occured it should not be necessary to make any further configuration/modbus address changes to the **D-Unit**.

If no configuration changes are necessary skip to the "general operations" section.

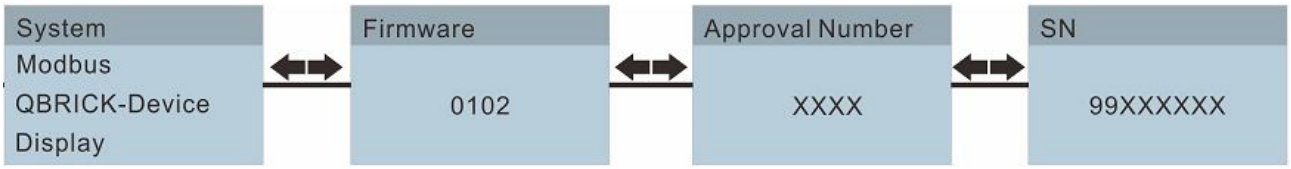
Comm parameter overview: The **D-Unit** works as a MODBUS master device on an RS-485 line with QBrick meters. The MODBUS address and communications settings for each QBrick DISP port must be known before daisy-chaining multiple QBricks together. (The default values are address=1, baudrate=9600, format=n.8.1). The **D-Unit** must use the same comm parameters as the QBrick in order to work. See below for details on changing the **D-Unit** comm parameters.

Making changes to configurations:

Comm parameter changes: Use the following instructions to change the **D-Unit** communication parameters to match the communication parameters of QBricks on the RS-485 DISP bus.

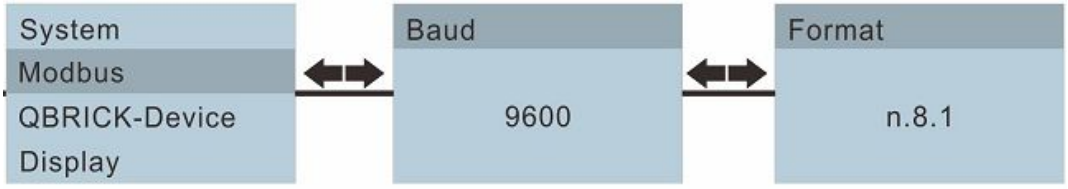
1. In any of the display screens, press the ▲ button and hold for 5 seconds to enter the **D-Unit** configuration menu:

2. There are 4 sub-menus within the configuration menu. Press the ▲ or ▼ button to select one of the sub menus, then press the ◀ or ▶ button for more configuration options or information.

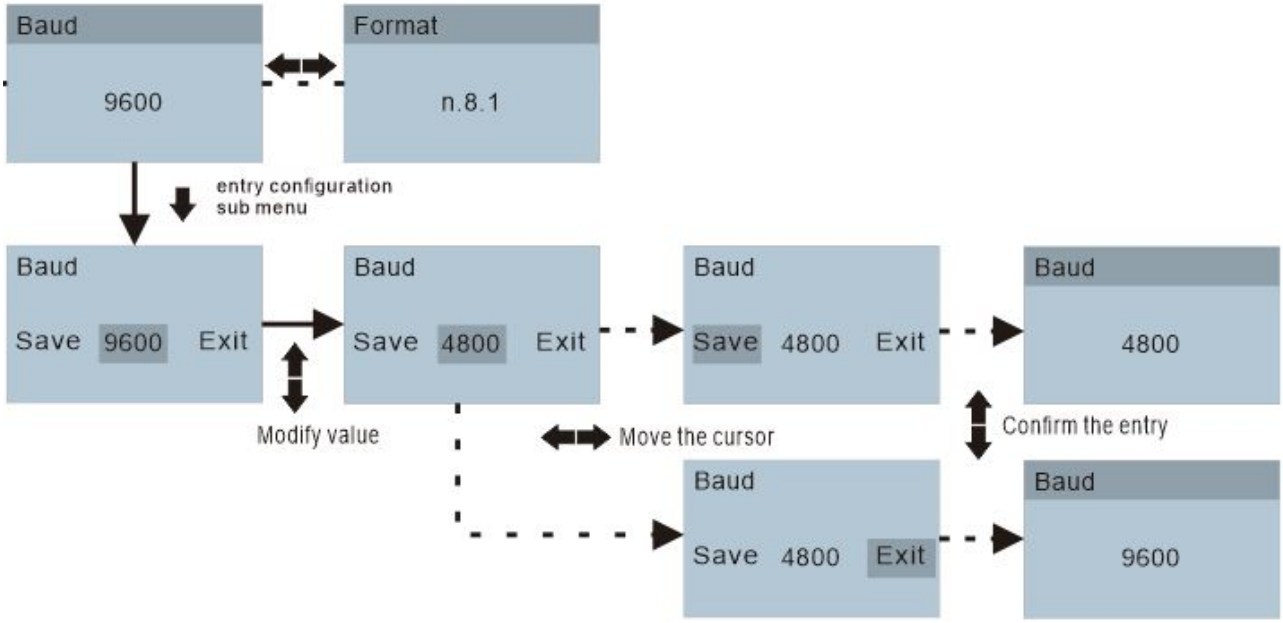


3. In the “System” menu, press the ◀ or ▶ button to show the firmware version, approval number, and serial number sub screens.

4. Go to the next configuration menu item, “MODBUS”, press the ▼ button.



5. In the “MODBUS” menu, press the ◀ or ▶ button to show the D-Unit baud rate and data format sub screens.



6. While in the baud rate and data format sub screen, press the ▼ button to select the value to be configured. When the value is selected, it will be highlighted, and the “exit” / “save” options will appear on each side.

7. While the value is highlighted, press the ▼ or ▲ button to increase / decrease the value (or select a different value). When the value to be saved is selected, press the ◀ button to select the

"save" option, and press either the ▼ or ▲ button to save the configuration. If the configuration is not to be saved, press the ▶ button to select the "exit" option, and press either the ▼ or ▲ button to exit the configuration without saving.

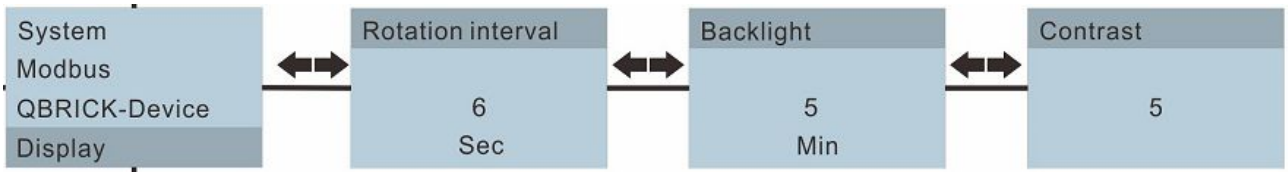
The **D-Unit** baud rate can be set to 2400, 4800, 9600, or 19200.

The default baud rate is 9600.
The data format can be set to n.8.1, e.8.1, o.8.1 or n.8.2.
The first character sets the parity: n=none e=even, o=odd.
The second digit represents the number of data bits
The third digit sets the number of stopbits.

The default format is n.8.1 or: no parity,8 data bits, and 1 stop bit.

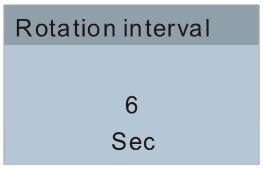
Changing the display settings:

To change the display configuration go to the next menu item, "Display", by pressing the ▼ button.



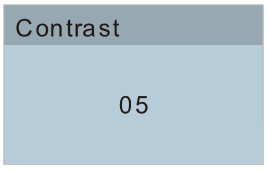
In this menu, press the ◀ or ▶ button to switch to the Rotation Interval, Backlight Timeout, or Contrast sub-screen.

While in the Display sub-screens, press the ▼ button to select the value to be configured. Press the ◀ or ▶ button to choose different settings, then press the ▼ button to save the changes or press the ▲ button to exit the setting without saving the changes.



The **D-Unit** can be set to cycle (rotate) through each parametric display screen automatically, switching to the next screen every set number of seconds. This interval is configurable from 6 to 20 seconds, or it can be disabled by setting the option to "none".

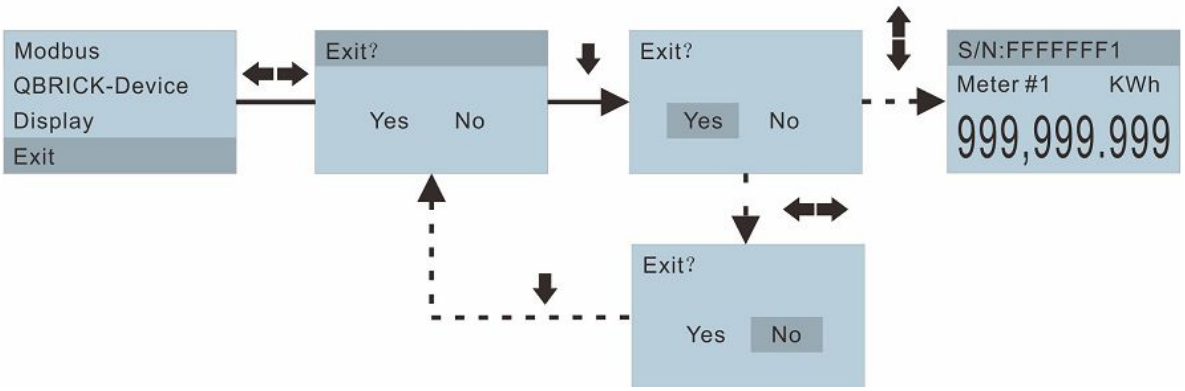
The backlight timeout duration determines how long after inactive use the backlight of the unit should turn off. This is configurable from 5 to 9 minutes.



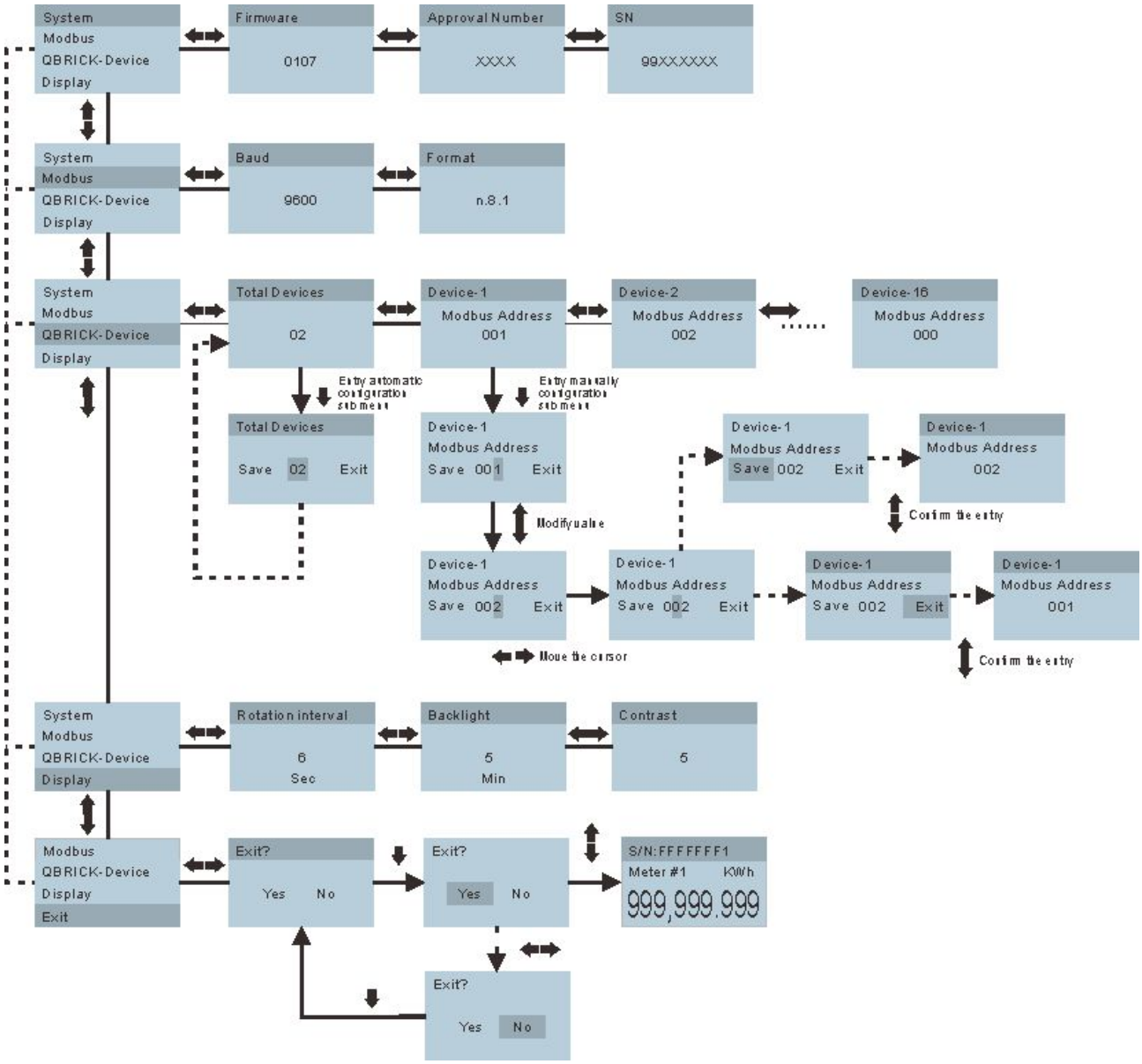
The screen display contrast value can be set to a value ranging from 1 to 9, where 1 is the minimum contrast and 9 is the maximum. The default contrast value is 5.

To exit the **D-Unit** configuration screen, scroll to the “Exit” option of the configuration menu, then press the ▶ button. This will show a confirmation screen. Press ▼ to highlight the “Yes” or “No” row, then press the ◀ or ▶ button to select the desired action. Then press ▼ again to confirm the selected action.

Choosing “Yes” will jump to the metering screen. Choosing “No” will return to the ‘Exit’ confirmation screen.



Overview of the screen tree for the configuration menu:

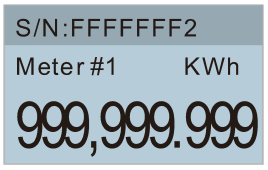


General Operation:

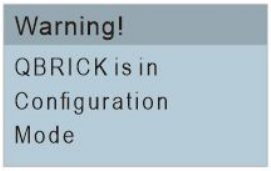
When the **D-Unit** and the QBrick are correctly configured, then the **D-Unit** will show the following meter parameter on the display screen:

S/N represents the QBrick serial number
Meter # 1 kWh represents the metering point and unit of the value displayed
The energy value is precise to 3 decimal places, and has a digit display height of 7.62 mm.

Press the ◀ or ▶ button to scroll to a different connected QBrick:

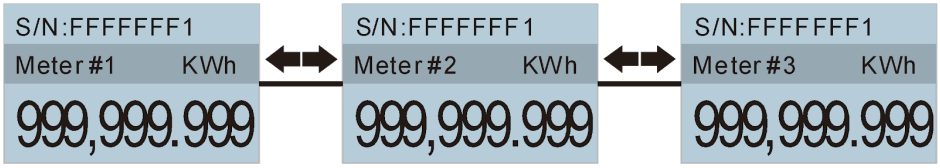


If the screen shows “COMM Error” verify that the **D-Unit** comm parameters are set correctly and that the QBrick and **D-Unit** are wired correctly and have power. If comm error persists see the troubleshooting section or call Quadlogic Technical support.



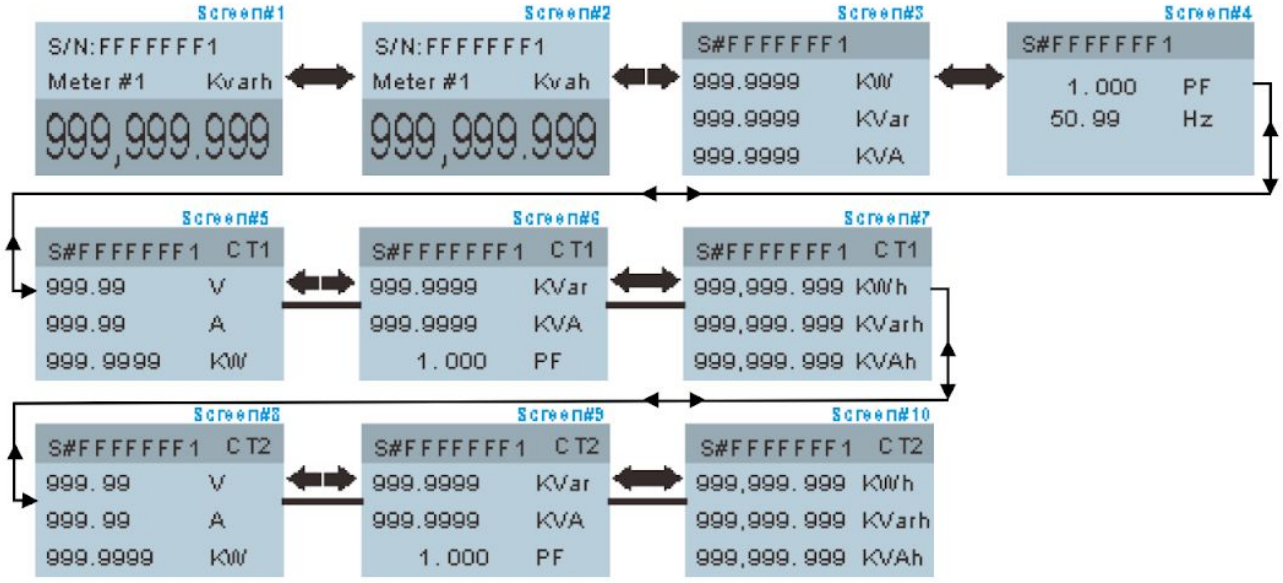
If the QBrick K-485 switch is “unlocked”, the **D-Unit** will show a warning screen to notify the user. Press any button to skip the warning screen and jump to the monitor screen.
Note: When a single QBrick is connected to the **D-Unit** and the QBrick K-485 switch is “unlocked”, the **D-Unit** will automatically jump to this warning screen every 60 seconds.
If multiple QBricks are connected, the **D-Unit** will display the warning screen only when the QBrick with the “unlocked” K-485 switch is selected.

Press the ▼ button to scroll to the next parameter, then press the ◀ or ▶ button to see the kWh values of each metering point within the selected QBrick.



Press the ▼ button again to select the next parameter.

Then press the ◀ or ▶ button to show the main parameters available for metering point 1. This example is for a 2-phase meter (additional screens will appear for 3-phase meters):



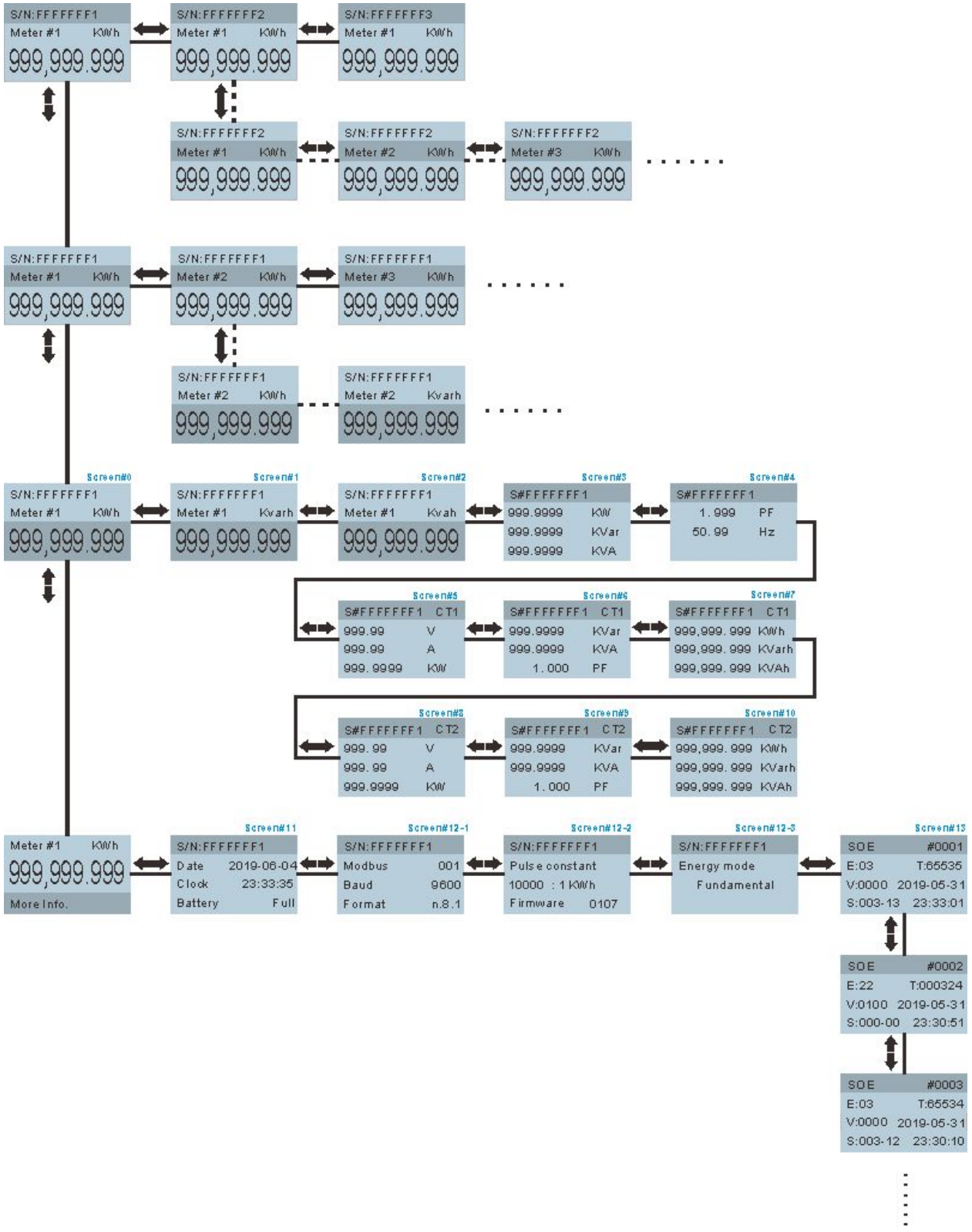
Screen #1 and Screen #2	Shows the total delivered reactive energy and apparent energy of the selected metering point
Screen #3 and Screen #4	Shows the total delivered active/reactive/apparent power, power factor and frequency of the selected metering point
Screen #5 to Screen #7	Shows parameters on CT1 for the selected metering point: voltage, current, active / reactive / apparent power, power factor, and active / reactive apparent energy
Screen #8 to Screen #10	Shows parameters on CT2 for the selected metering point: voltage, current, active / reactive / apparent power, power factor, and active / reactive apparent energy

Press the ▼ button again to scroll to the more info screen.

Then press the ◀ or ▶ button to show other info parameters within the selected QBrick (Note: screen numbering will be different for 3-phase meters):

Screen #11	Shows the system time calendar / clock and battery info
Screen #12	Shows the MODBUS configuration of the QBrick, pulse constant, firmware version number, and energy value display mode (fundamental or total).
Screen #13	Shows the Sequence Of Events (SOE) recorded in the QBrick. Press the ▼ and ▲ buttons to scroll through the list of events. The abbreviations for the record events are as follows: E: “Event code” T: “Event counter” V: “Variable data” S: “Serious failures counter” For further details please refer to the QBrick Manual

Overview of the screen tree of regular metering parameters (note: screen structure will be slightly different for 3-phase meters):



5. Troubleshooting

5.1. D-Unit does not power up

1. Make sure the AUX terminal is wired according to Section 4.2
2. Verify that fuses or disconnects on AUXlines are intact.
3. Measure the voltage connections at the AUX terminal, if proper voltage is present and display is OFF then contact Quadlogic Technical Support.

5.2. Issues communicating with QBrick

1. Make sure that the RS-485 wires are connected properly at the RS-485 port of the D-Unit and the DISP port of the QBrick.
2. Check RS-485 wire lengths, refer to the QBrick Application Notes document for more details.
3. Check that the MODBUS settings on the **D-Unit** are set correctly.
4. If communications issues persist contact Quadlogic Technical Support for help.

6. Maintenance

The **D-Unit** does not require any special maintenance. If the system infrastructure requires maintenance the unit should be closed and powered off.

Contact QLC customer support for any issues with the unit.

7. Supplemental Info

7.1 Changing the D-Unit modbus address list:

The **D-Unit** communicates with up to 16 QBrick meters over their modbus DISP port. At the time of commissioning each QBrick will have its DISP modbus port address set to a unique number between 001 and 016. This DISP port modbus address is stored in register 1213 on each QBrick. At the same time, the **D-Unit** will be programmed with a list of the DISP port modbus addresses as assigned by the QTao or other host device. The **D-Unit** will poll each meter on the network based on the meter's DISP port modbus address in this list, 001 - 016.

If you need to change the **D-Unit** modbus address list after commissioning you can use the following instructions. We recommend contacting Quadlogic's technical services department before making these changes on your own.

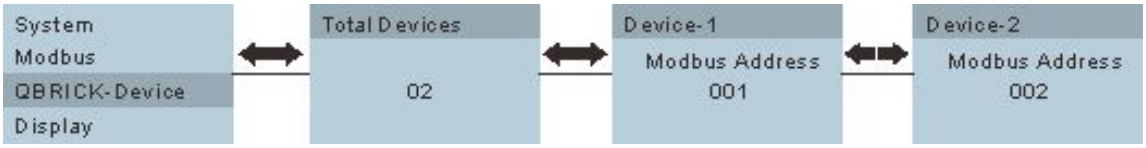
There are two methods for changing the DISP modbus address list in the **D-Unit**.

Note: Changing the modbus address in the **D-Unit**'s list does NOT change the actual modbus address in the DISP port modbus address register on the QBricks. If you need to change the modbus registers inside the QBrick contact Quadlogic Technical Support for help. You must verify that the address set in the **D-Unit**'s list matches the address in the QBrick's DISP port modbus address register.

1. Automatic modbus address list creation - Adds modbus addresses 001 to 016 to the **D-Unit**'s list based on total number of devices input by user. Sets all unused list slots to 000.
2. Manual modbus address list modification - The modbus address list may be changed manually if the automatic slot number assignment feature cannot be used. For example, if a meter needs to be replaced you can use this method to add the new modbus address to the list.

7.1.1 Automatic method:

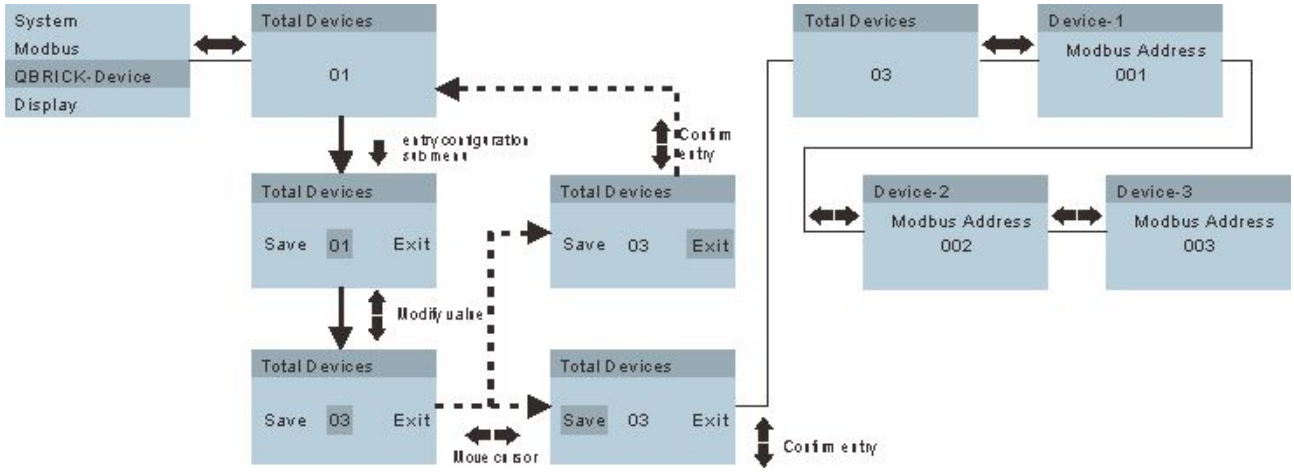
1. Go to the configuration menu item, "QBrick-Device" menu, by pressing the ▼ button.



2. In this menu, press the ◀ or ▶ button to switch between showing Total Devices and Device-1 to Device-16 Modbus addresses numbers. In the example below, there are 2 QBrick units connected to the **D-Unit**. QBrick#1 has MODBUS address 001, QBrick#2 has MODBUS address 002.

3. The"Total Devices" screen allows the user to set a value from 1-16. The D-Unit will automatically configure the MODBUS address list so that Device-1 will be 001, Device-2 will be 002 and so on. Unused Device slots will have their modbus address set to 000 and will be hidden in this sub-menu.

The following example shows setting the Total Devices value to 3, and Device-1 to Device-3 are automatically assigned addresses.



7.1.2 Manual Method:

1. Use the "Device-X" menu to change or add individual modbus addresses to the **D-Unit's** list. From the Device-X selection press the ▼ button to configure the address parameter.

2. The following example shows how to individually add modbus addresses to the **D-Unit**'s list. This example shows how to set the Device-1 modbus address to 002. Then continue to set the addresses for Device-2 to Device-X, until all connected QBricks are in the **D-Unit**'s modbus address list.

3. If you need to skip a device for some reason you can set the modbus address to 000. The device will not appear on the total devices list. Also if you are not using all 16 devices set the unused devices to address 000. If an unused device slot is not set to 000 the **D-Unit** will show a comm error when it tries to communicate to a QBrick that does not exist.