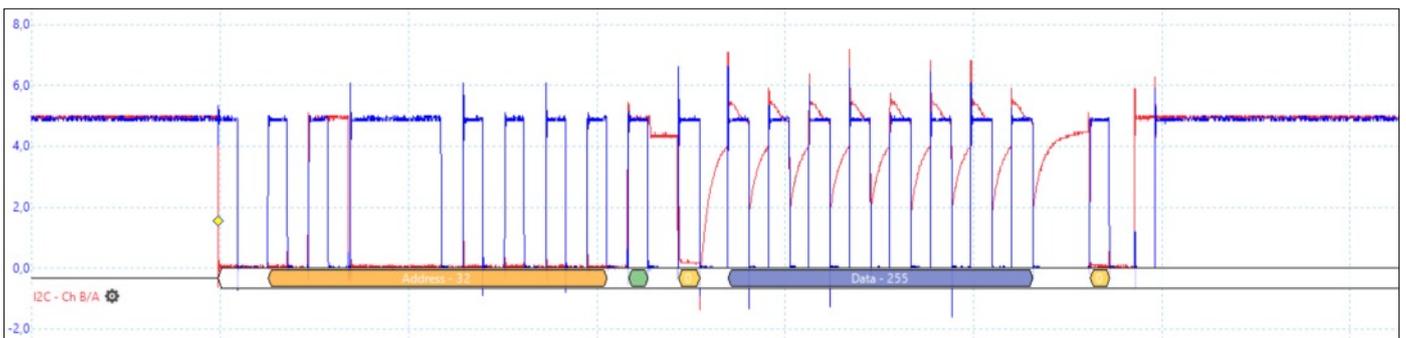


# LinTronic

## I2C



Updated: 210228 (yymmdd)

## TT455-RT-238 includes a software controlled I2C bus

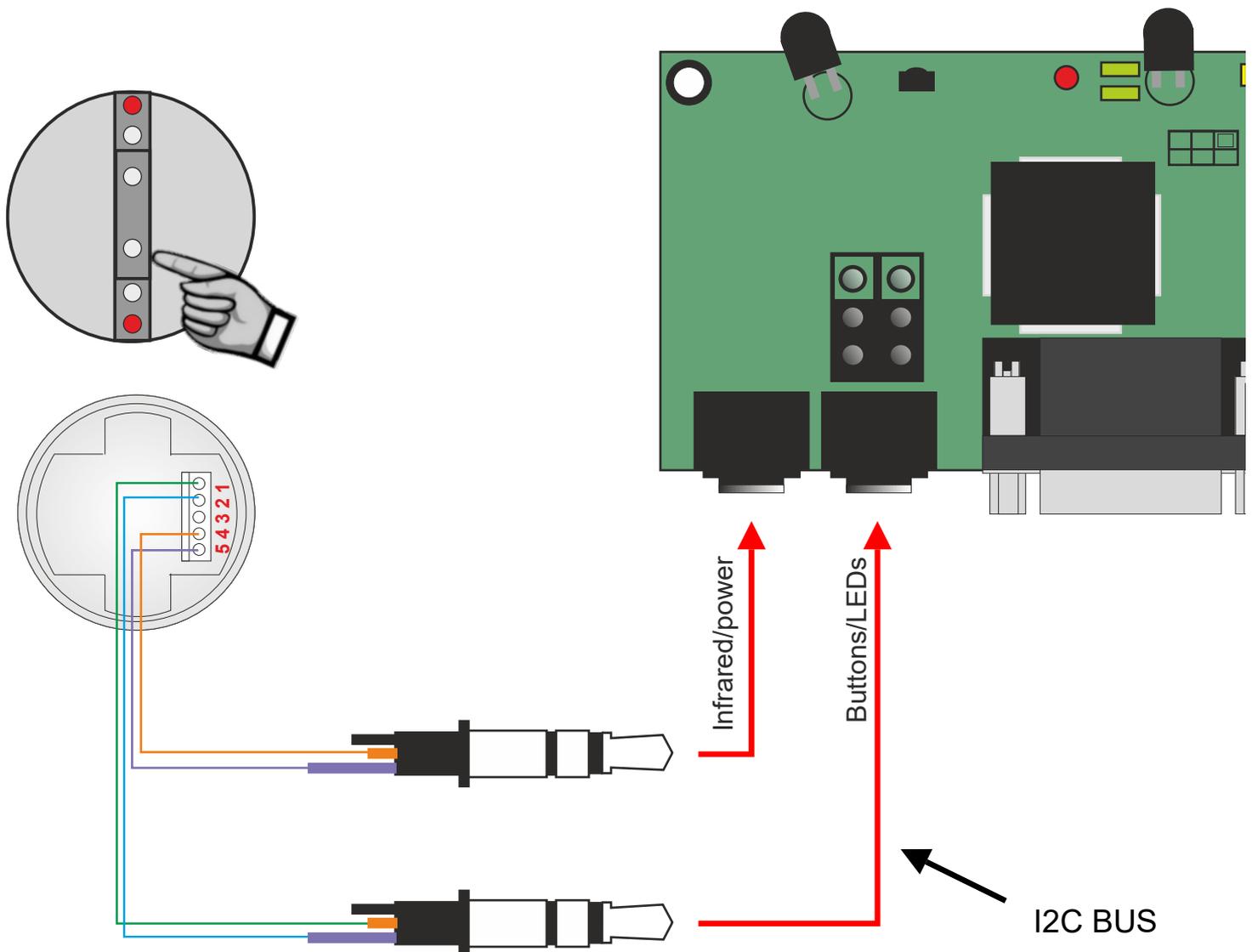
When we read how you operate the buttons, or when we control the LED's of the external B&O IR receiver, we actually do it by simulating a standard communication protocol called Inter-Integrated Circuit (IIC or I2C).

If you want to learn more about I2C, see this link:

<https://en.wikipedia.org/wiki/I%C2%B2C>

For info about the IR receiver, see this link:

[http://lintronic.dk/AppNote\\_TTIR8087030.pdf](http://lintronic.dk/AppNote_TTIR8087030.pdf)



# Scanning the I2C bus

The Memory Map / Digital Inputs/Outputs includes a scanning tool for the I2C bus.

Click the “Test” button to start the test.

The “Replied” text field will show the addresses which were detected.

B&O receiver is address 32

Arduino 1602 display is address 39

Click the “Initialize I2C devices” to reset the connected devices.

IR/RF RemoteControl Project MemoryMap Settings Digital Input/Output Dealers projects Products/Commands

This section covers the 9-pin subD connector. Pin numbers are numbered [x]

INPUT 1 - [1]  Standard

INPUT 2 - [4]  Standard

OUTPUT 1 - [6]  Active 12 Volt  Active Ground  Conson [Conson.doc](#)  RF output [How to send RF](#)

OUTPUT 2 - [9]  Active 12 Volt  Active Ground  BeoSystem

RED LED  Off  Trigger/Action  IR test

GREEN LED 1  Off

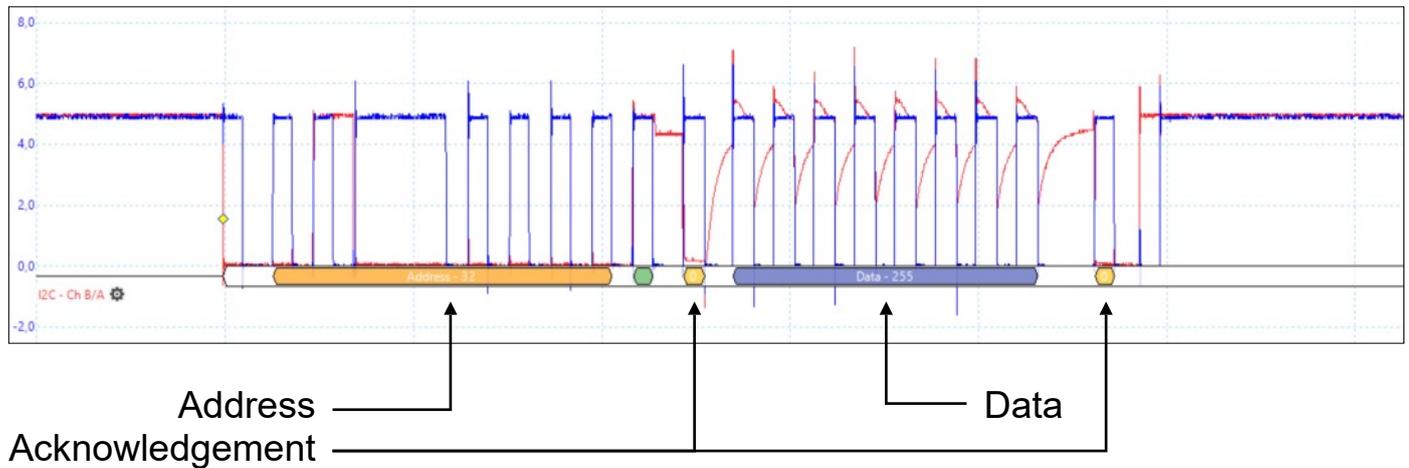
GREEN LED 2  HeartBeat Off  HeartBeat On

RS232 comport 1 - [Rx=pin 7, Tx = pin 8, Ground = pin 5]   Standard  Triggers to Comport 1  Comport 1 > Comport 2  LinTronic protocol

RS232 comport 2 - [Rx=pin 3, Tx = pin 2, Ground = pin 5]   Standard  Triggers to Comport 2  Comport 2 > Comport 1  LinTronic Protocol [LinTronic Protocol](#)  915: Mode/Trigger to Comport 2 [Mode/Trigger, Command 915](#)

I2C BUS  Testing  Replied

# Detecting a B&O IR receiver



The I2C protocol dictates that a slave-device has an address in the range from 00 to 127. When the master sends out the slave-address, an instant acknowledgement confirms that the slave is listening and ready to receive or transmit data.

When data is received or transmitted by the slave an instant acknowledgement confirms that data was correctly received (from master) or transmitted (to master).

When the TT455-RT-238 is powered up, it checks how many of the supported devices is connected to the TT455-RT-238 I2C bus, by scanning the bus for known addresses that could return an acknowledgement when contacted.

The external B&O IR receiver holds address 32 (decimal format) which is 20 in HEX format. If the IR receiver is detected you will see the two LEDs turn on briefly.

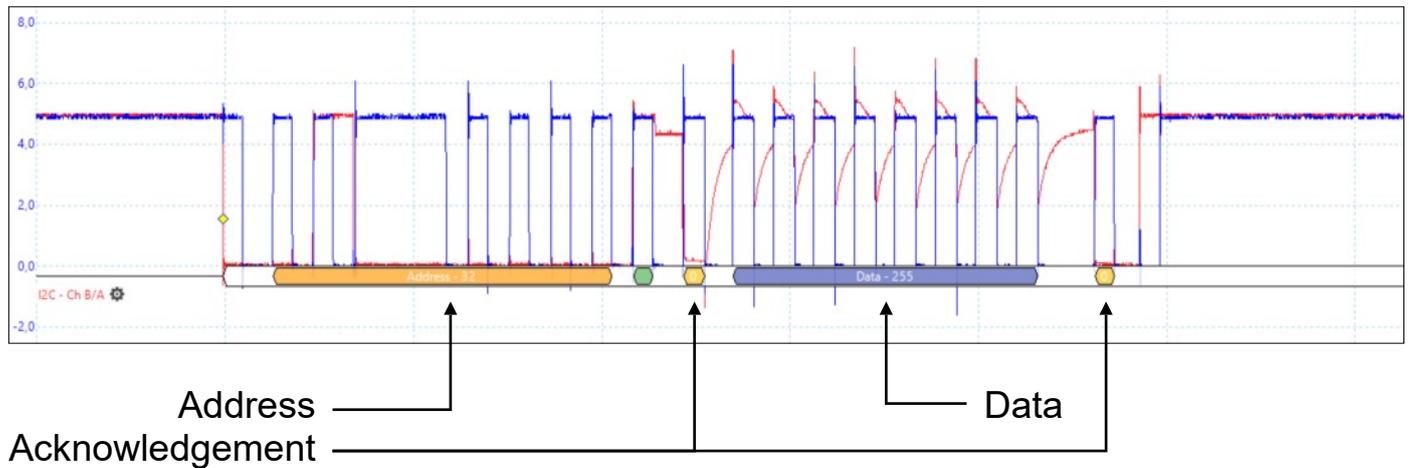
If an acknowledgement is not received from the B&O IR receiver, then you have not connected a cable to the I2C bus, or the internal jumpers have been set for low-power IR output.

The TT455-RT-238 can control the LED's of the IR receiver, allowing you to use them as indicators/Actions:

<http://lintronic.dk/supportedproducts.aspx?AudioVideoID=2065>

The TT455-RT-238 can read how you operate the 4 buttons on the IR receiver, allowing you to use them as Triggers. The buttons are scanned 10 times per second.

# Detecting a display



When the TT455-RT-238 is powered up, it checks how many of the supported devices are connected to the TT455-RT-238 I2C bus, by scanning the bus for known addresses that could return an acknowledgement when contacted.

We support standard low-cost Arduino displays (1602, 16 characters, 2 lines) holding address 39 (decimal format) which is 0x27 in the HEX format.

If an acknowledgement is not received from the display, then you have not connected a cable to the I2C bus, or the internal jumpers have been set for low-power IR output.

If the display is found, it will print “TT455-RT-238” as indicated below and hardware type as well as the current software version.

Examples of 1602 I2C displays:

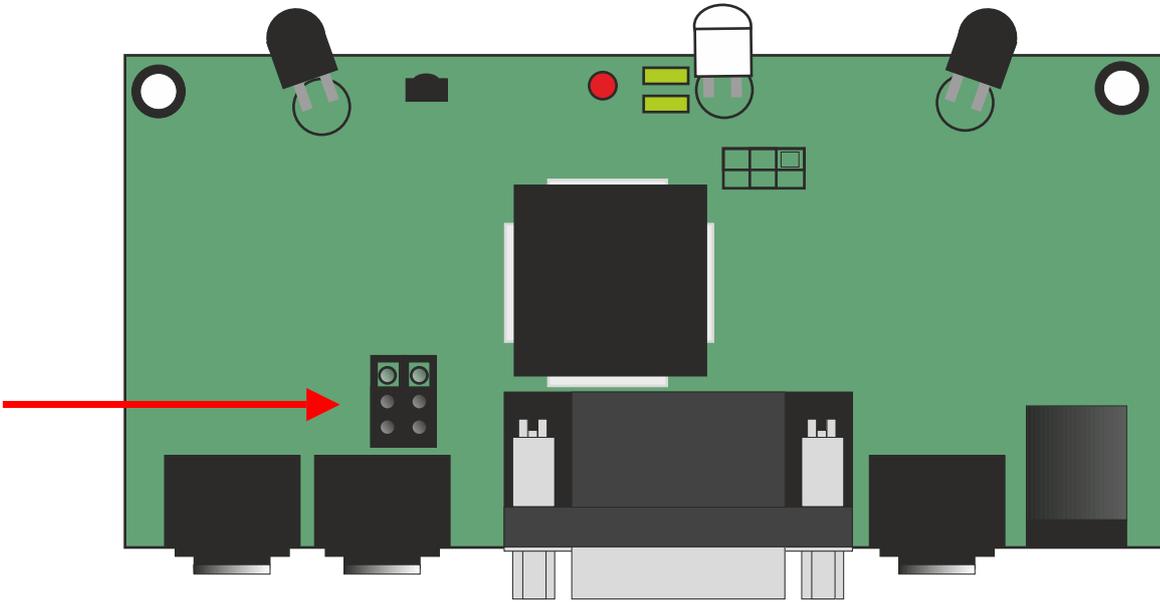
<https://jentrionic.dk/39-iot-displays>

So far the display has mainly been used as debugging/error tracking, but we are ready to open up for other things.

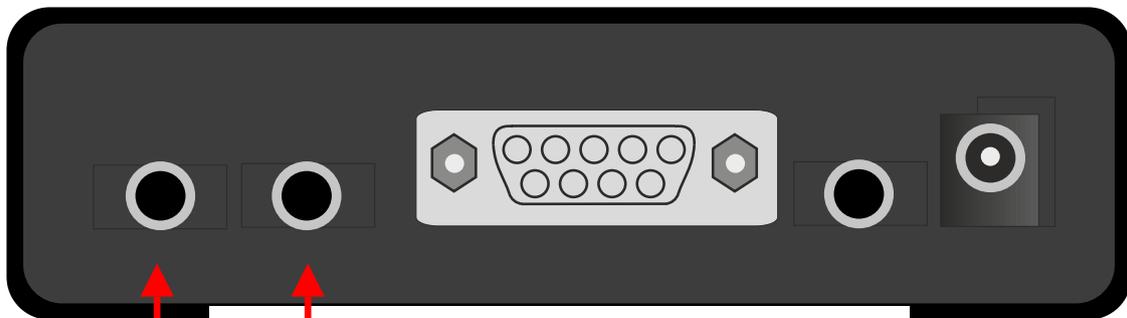


Also we are ready to support other products capable of communicating on i2C: Temperatur sensors, etc.

# Connecting a display



Ensure that the internal jumpers are set like shown (default).



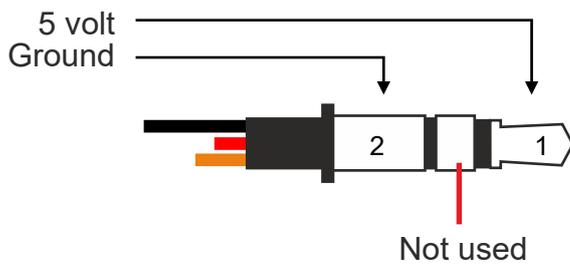
I2C bus ( SDA and SCL )

Power ( 5 volt and ground )

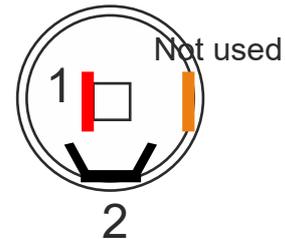
Make two cables using two mini jack 3.5 mm stereo connectors.

# How to make display Power and I2C cables

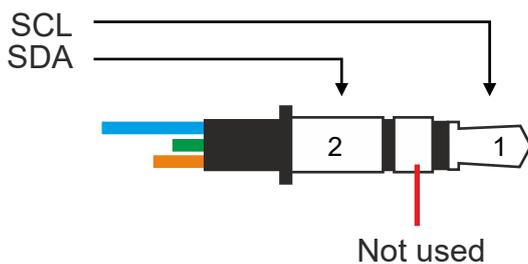
## POWER CONNECTOR



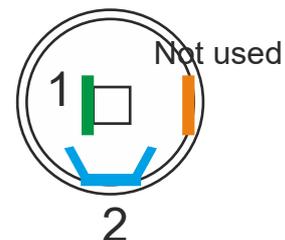
Stereo  
Jack 3.5 mm  
connector



## I2C BUS CONNECTOR

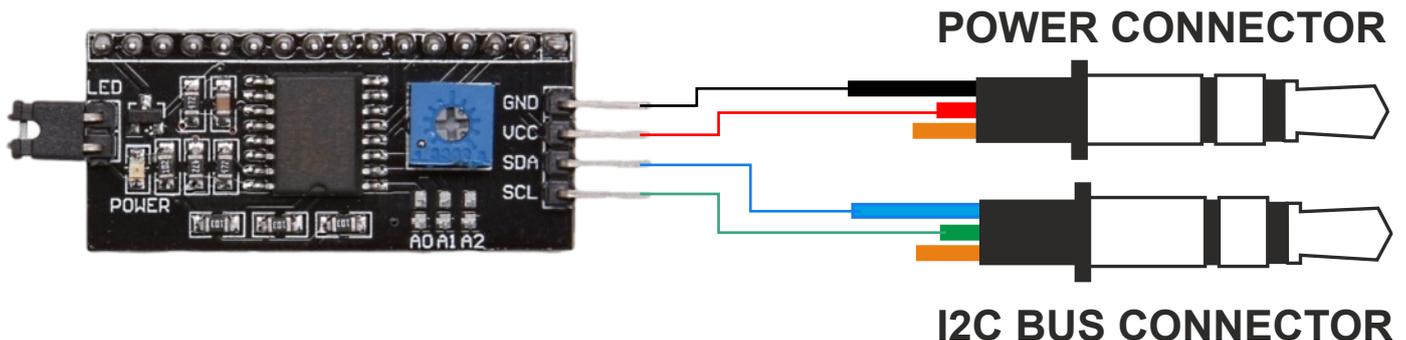


Stereo  
Jack 3.5 mm  
connector



## Connect the two connectors to the backside of the display

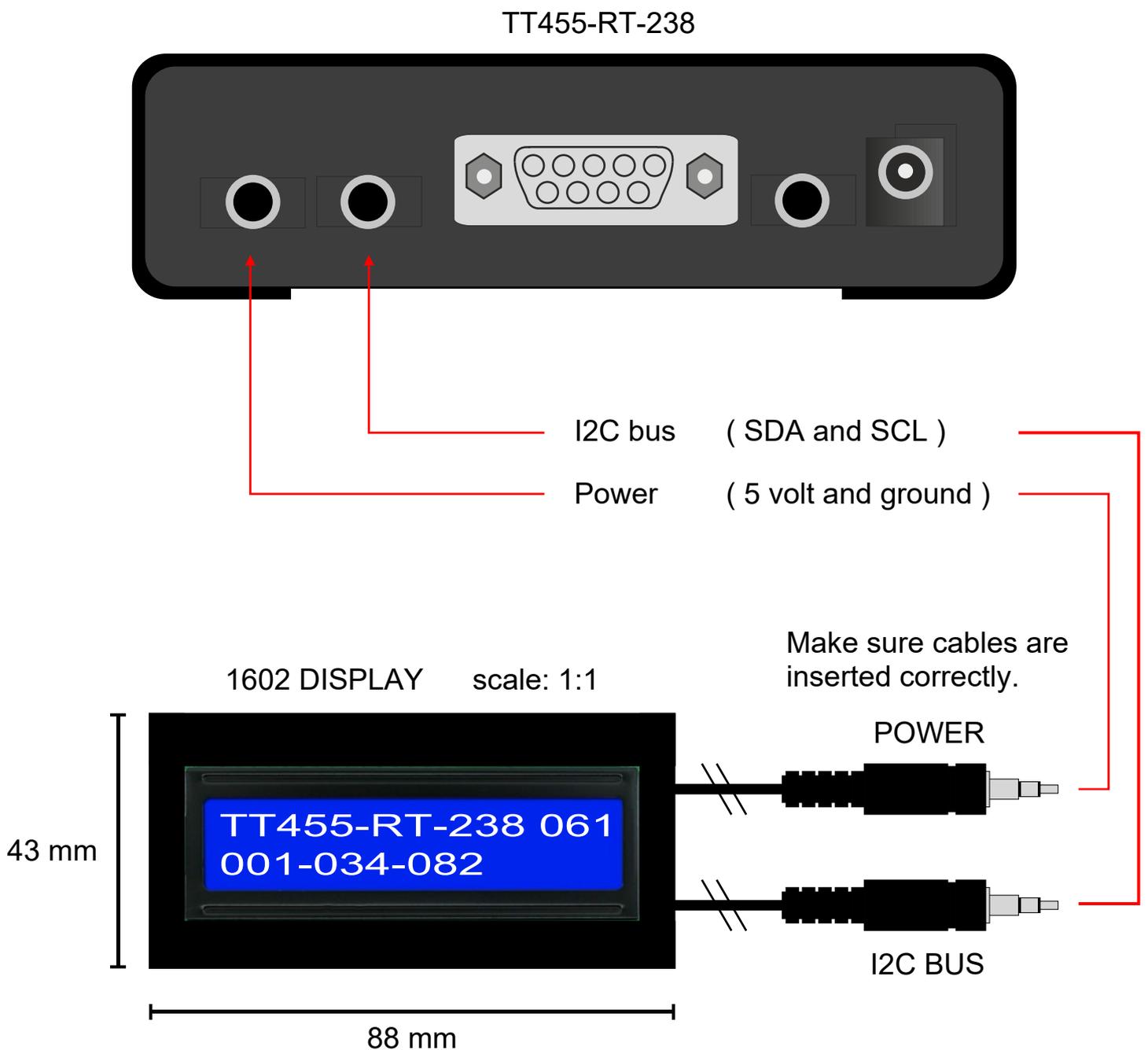
The shown wire colors are only examples. You can use any colors you like. If you cut an existing cable to use the wires, please ensure you use the correct pins/wires.



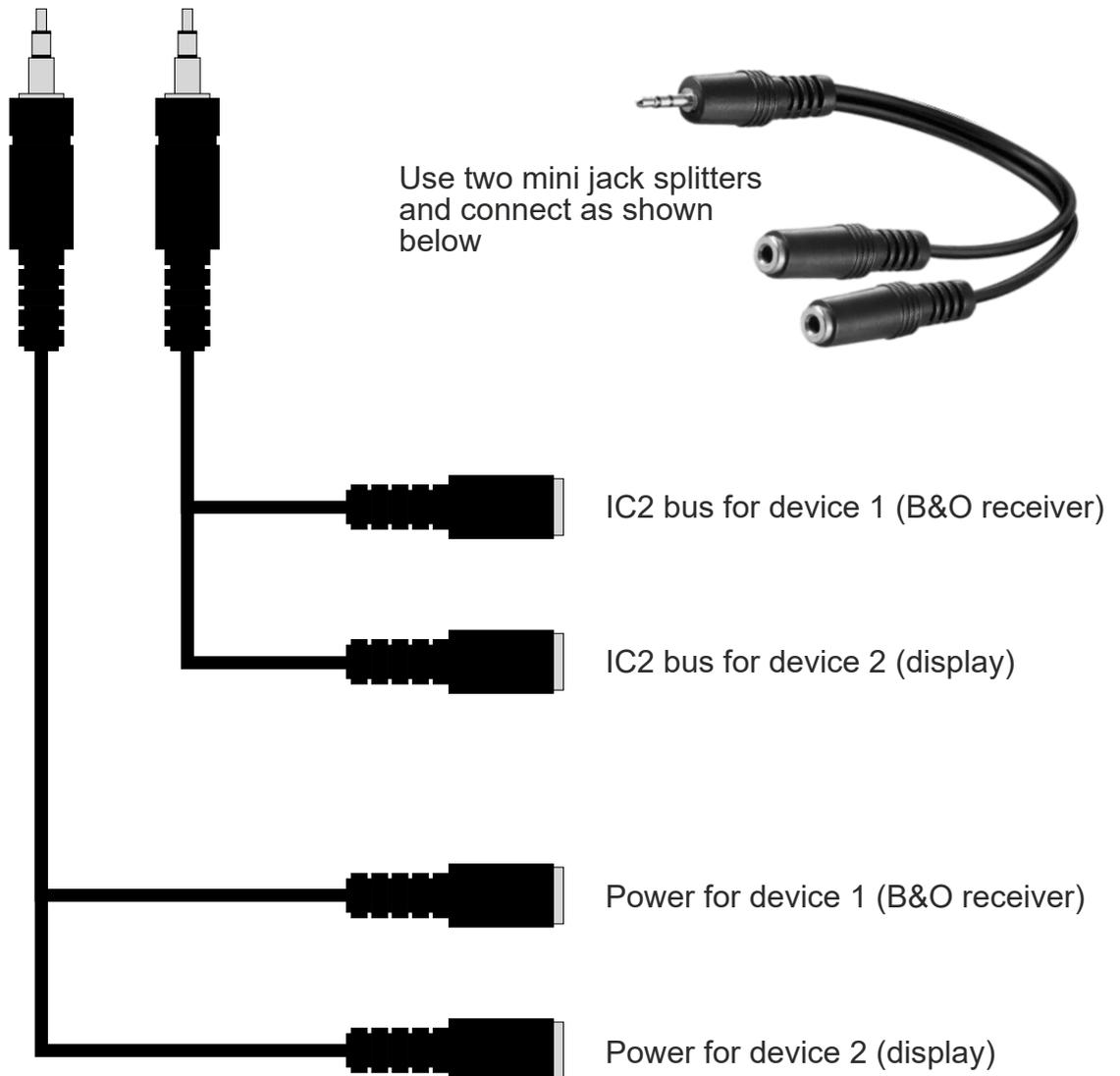
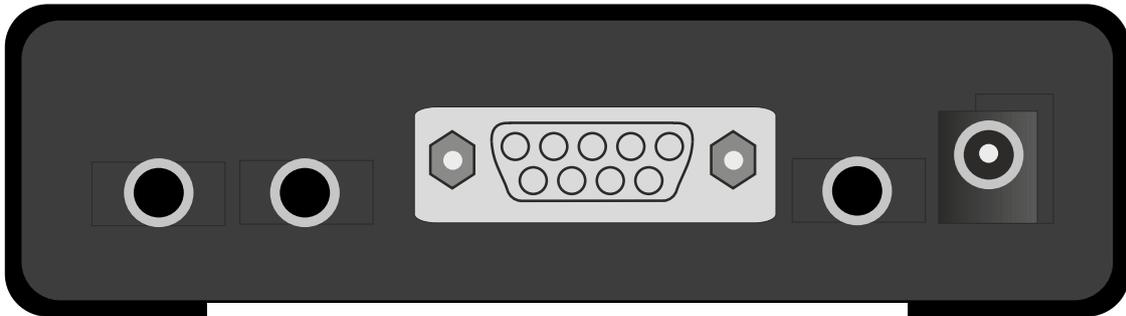
# Dimensions

For test purposes and customer assistance/approval we deliver the display in a 3D printed plastic cabinet.

We offer this cabinet for your own displays. Simply contact us for a low-cost quotation. Please observe that the cabinet can have minor cosmetic flaws.

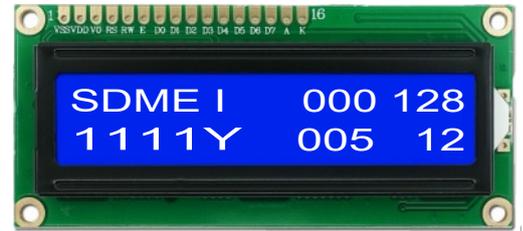


# Multiple devices on the I2C bus



# Using the display as test tool

A dealer was having problems with a couple of his clients experiencing that the TV turns on automatically - typically during night time. In order to learn whether the TV was activated by the Beo remote or by a software error in the TT455-RT-238, we created a special test firmware to help us find the problem.



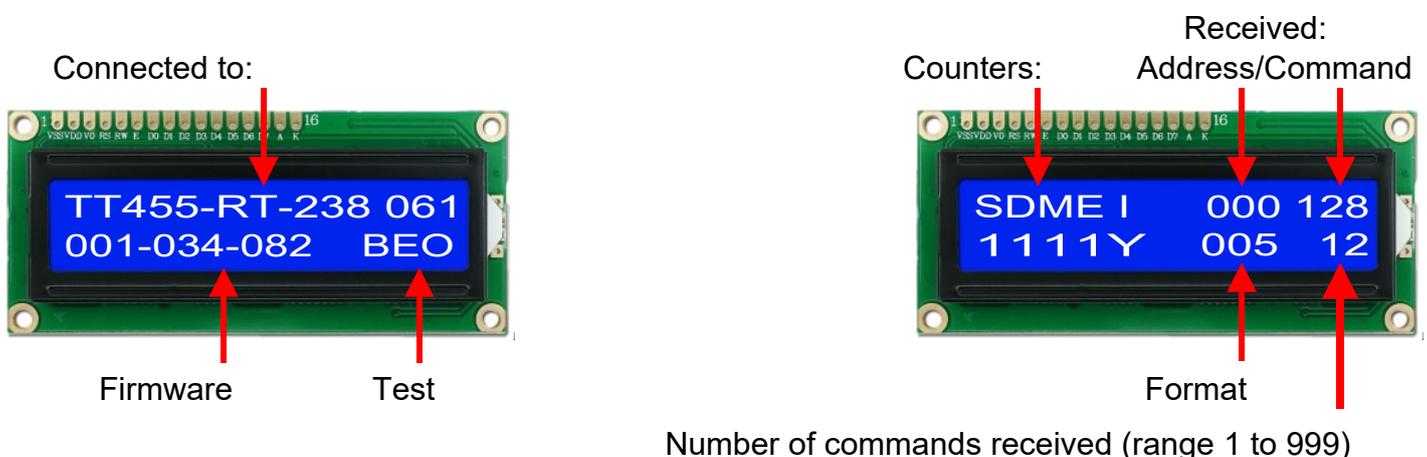
The TT455-RT-238 firmware detects five events:

- S: a B&O stop-signal is detected (the stop signal is the last part of a 17-bit long command)
- D: the code was decoded correctly
- M: the code is passed to Memory Map and an Action was found
- E: the Memory Map Action was Executed
- I: B&O receiver detected Y/N.

For each event triggered, a counter will be incremented (range 1 to 9). If a full Beo signal is received, all four counters should increment. If the M and E counter increment on their own, then the TT455-RT-238 is the cause and we know where to search for the problem. If the problem is detected but the current test firmware does not lead us to a solution, then we can add more features in order to find the problem.

## How to start the test:

- Place the Beo remote in a position, allowing it to send commands to the TT455-RT-238's external IR receiver. We want to detect whether the Beo4 has a firmware problem and want to be able to detect possible signals coming from the remote.
- Do not manually activate the Beo remote for the rest of the night. Let the firmware work.
- Turn off the power to the TT455-RT-238, connect the display, wait 5 seconds and turn on power. TT455-RT-238 will start up and initialize the display as shown below. If any events are detected during night time, the counters will be displayed and hopefully we will learn whether a signal was detected by the Beo remote or generated by the TT455-RT-238 firmware.



In order to reset the test-counters and restart the test, activate the Beo remote: LIGHT 0 0 0  
Wait 3-5 seconds, allowing display to re-initiate.