CUIS

Coordinated Universal Interworking Standard

International Electronics Consortium

IEC

CONTENTS

CONNECTIONS

Connections can be used to transmit information from one place to another. This is doubtless blindingly obvious to everyone reading this document - so too probably is the intention of every connection type seen in the following pages - however this document seeks to be a comprehensive guide to the details of those connections. What rules they follow, what connections can and can't do, what quirks they have, etc.

In doing so, we hope to create an understanding of what is going on when one unit attempts to transmit something to another unit, or indeed what is going wrong.

This document describes the four main connection types and each connection type has its own distinctive colour - Red: Signal, Green: Voltage, Orange: Audio, Blue: Data - allowing for easy identification of ports and cables. You can only connect ports of the same type. There may be additional restrictions to connections depending on the each port's configuration, which are described in their respective sections. If a section doesn't comment on additional restrictions, one can assume that there are none.

Reactive Operations

There are two reactive operations which are activated on all connection types when for when a connection is made, and when one is broken. These are known as "onconnect" and "ondisconnect". These operations are performed on all ports for both events, and receive an "instigator" boolean value, which informs the port whether the connection initialised the connection, or received it.

Other reactive operations can be found in specific connection types, which are described in their respective sections.

Cable Glow

Connection cables have the ability to glow. This is activated at the type's discretion. For example; Signal connections will glow when active, Voltage will glow whenever the value is above zero. Data connections will flash when a message is sent. Audio connections do not glow. These are in no way a standard method of operation, and whether a connection cable glows or not will have no effect on whether the transmission is successful. It is purely an aesthetic choice.

RED

For the transmission of signals

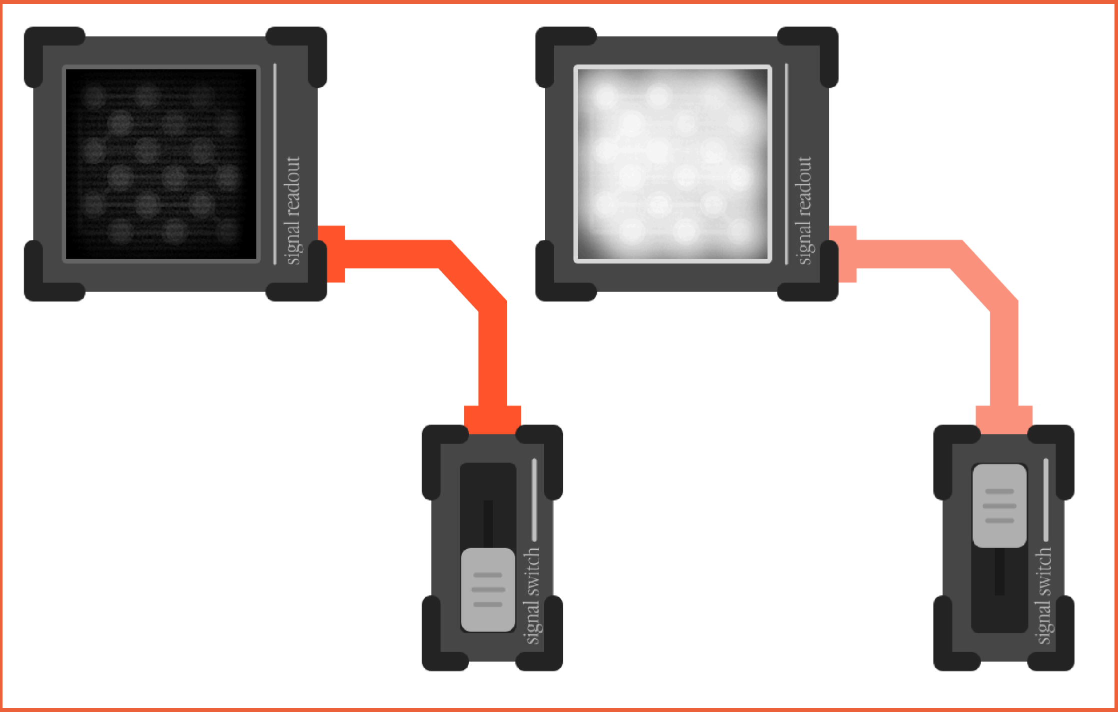
The simplest of the transmission types, a “Signal” is defined as a state of either active or inactive. Classically this is represented as being either zero (0) and one (1), but can also be referred to as “false” and ”true”, or “on” and “off”.

It is possible to “double-send” an active or inactive signal, which will be interpreted as though a transmission of the opposite signal was sent, instantly followed by the next signal. For example, if the current signal was “active” but then one was to send another “active” signal; the receiving end would receive this sequence as “active-inactive-active”, with the “inactive” signal existing for the minimal length of time that the receiving unit understands.

Transmissions of this type do not have direction. As such any connection can be considered to have a “charge” that connected units contribute to. This charge is the “OR” of all contributing connections, thus if any unit sends an “active” signal; the entire connection is considered to be “active”.

There is one reactive operation which is activated when a signal changes - including for the same unit that made the change - known simply as “onchange”. This operation will receive the current signal state.

Below, one can see the IEC Alpha “Signal Readout” and “Signal Switch” units connected in two conditions. In the left condition the signal is “inactive” while in the right condition the signal is “active”.



GREEN

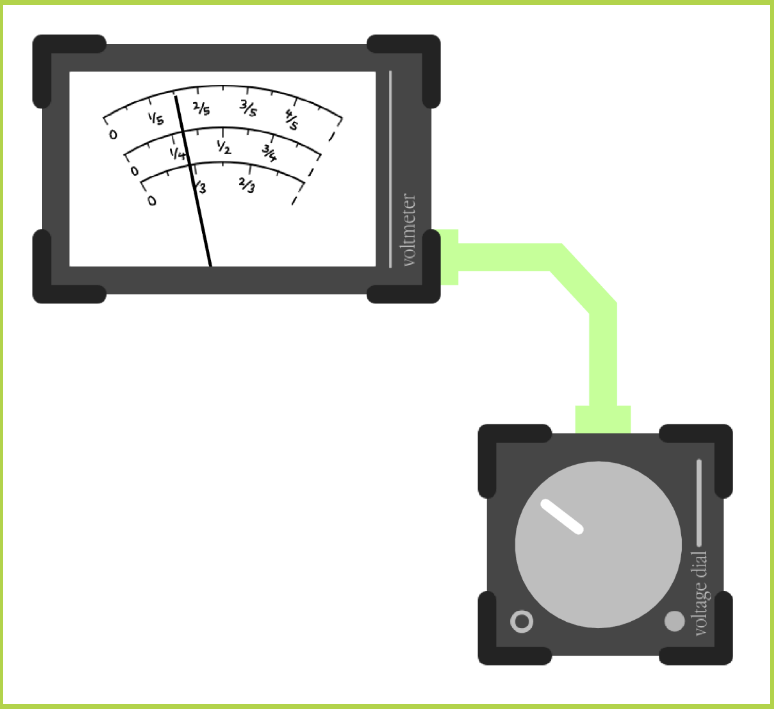
For the transmission of voltage

"Voltage" is defined as any Real number. Typically these numbers are limited to between zero (0) and one (1). Though any number can be used at the designer's discretion, care must be taken to protect the internal circuity of a unit against unexpected values.

Voltage transmissions are commonly used for the automatic control of user accessible interface items, such as dials and sliders. These are values that are not expected to change at a very high frequency, like can be found in audio signals. For very high frequency automatic control see the "Orange" connection type.

Transmissions of this type do not have direction. As such any connection can be considered to have a "charge" that connected units contribute to, or subtract from.

There is one reactive operation which is activated when a voltage changes - including for the same unit that made the change - known simply as "onchange". This operation will receive the current voltage value.



In the image to the left, one can see the IEC Alpha "Voltmeter" and "Voltage Dial" units connected.

The "Voltage Dial" transmits a voltage value of around 1/3 which the "Voltmeter" registers. Note how the "Voltmeter" is only capable of registering values between zero and one.

ORANGE

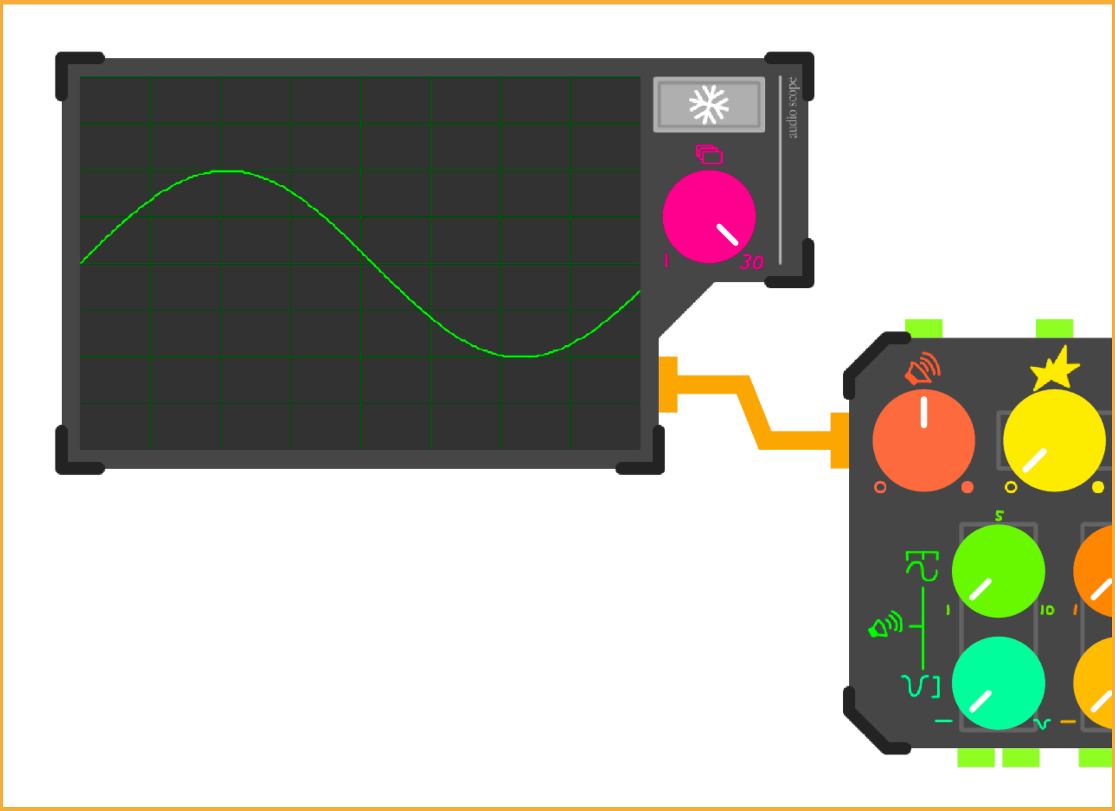
For the transmission of audio

“Audio” is defined as a rapid series of values. This connection type is used to facilitate the connection of audio nodes, though does not contain any audio nodes of its own. As such, one must designate an existing audio node for the connection port.

Audio connections have a specific direction, and as such ports can be declared as either “inputs” or “outputs”. No like-to-like connections are allowed. Additionally, it is possible for a designer to determine on each port which input and output channel indexes are used, respective of their direction, eg. declaring that a port with an “output” direction should use input channel index 2, will have no effect on the resulting connection. However declaring that the port should use output channel index 2, will have an effect. Typically the channel indexes are left as the default of zero (0).

Audio connections are often used for high-frequency control of other audio processing circuitry. For example, using one audio stream to control the amplitude of another.

Below, one can see the IEC Alpha “Basic Synthesizer” connection to the “Audio Scope”, as the “Basic Synthesizer” produces a sine wave with a amplitude of 0.5.



BLUE

For the transmission of data

“Data” is a term used to describe any computational data structure. In many senses this type of connection is a catch-all for what is not covered in the previous three types. “Data” is sent as part of a “message”. “Message” transmissions are considered to be atomic, though one is free to configure their units to maintain an internal state for multi-transmission communication. Messages consist of two main parts; the “address” and the “data”.

- *Address* - This is a string data structure. One can use the “address” part to signal to other connections what operation should be performed.

- *Data* - This is somewhat of an open standard, allowing designers to decide what structures they would like to use. Often this means that some possible connections will not be of use as the sending and receiving units will not be able to understand each other’s structures.

Additionally, connections of this type have two proactive operations and two reactive operations. These operations are designed in pairs.

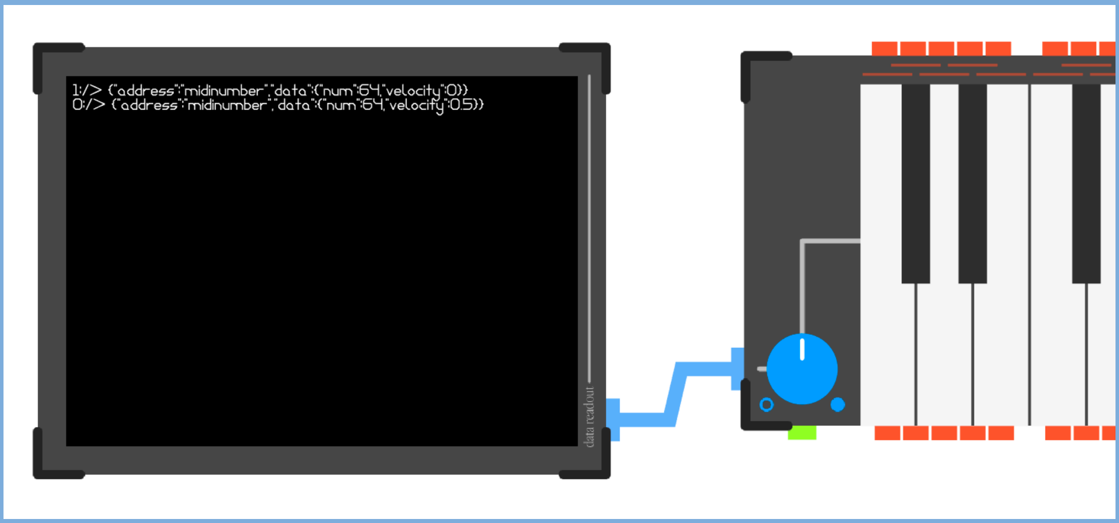
- send / onreceive

  Connections can “send” messages (proactive), which will activate the receiving port’s “onreceive” function (reactive). These transmissions consist of an address and data pair.

- request / ongive

  Connections can “request” data (proactive), which will active the receiving port’s “ongive” function (reactive). These transmissions only consist of an address. A unit will then have to actively use the “send” function in order to respond to a request.

Below, one can see the IEC Alpha “Musical Keyboard” and “Data readout” units connected together, as the “Musical Keyboard” sends messages. From the screen of the “Data readout” unit we can see that the address of the first transmission is “midinumber” while the data load is “{num:64, velocity:0.5}”



```
1:/> {"address":"midinumber","data":{"num":64,"velocity":0}}
0:/> {"address":"midinumber","data":{"num":64,"velocify":0.5}}
```

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