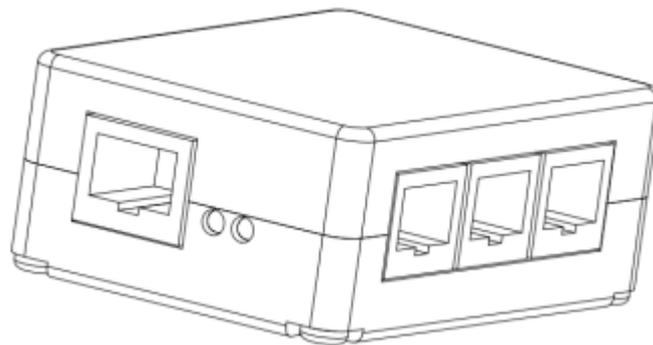K6-Team
NMEA-Multiplexer

K6 Mux 2

NMEA-Multiplexer for up to three devices

(HW 8.1.0, FW 4.4)

09.06.2015

The K6 Mux 2 combines the NMEA data from up to three devices with different data rates (2400 to 115200 baud) and forwards it to a terminal on a serial interface.

Freely configurable filters. The data can be sent and received in both directions at different speeds. The transmission speed can be configured either automatically or permanently.

For the devices connected to the inputs there are various data forwarding options including record filtering and baud rate changing available.

1 General description

1.1 Housing and connection ports

output
green LED
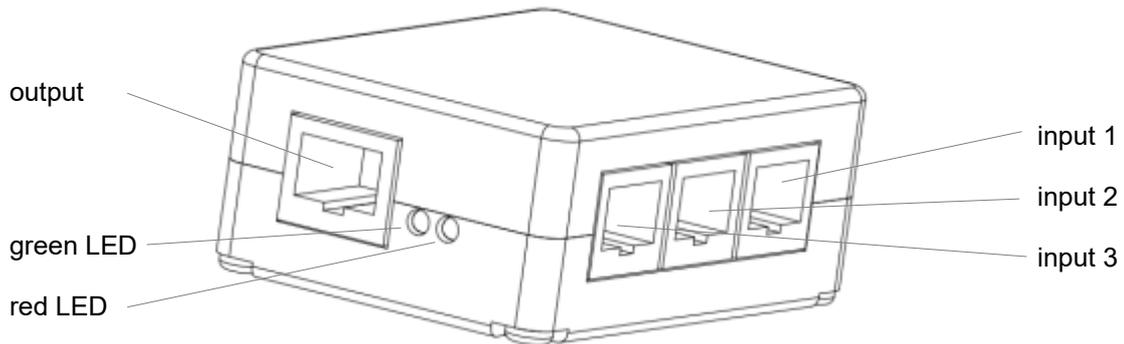red LED
input 1
input 2
input 3

figure 1: K6 Mux 2

The two-piece plastic housing of the K6 Mux is mounted with four screws.

The K6 Mux has three data inputs and one output. At the inputs 1 to 3, a NMEA source can be connected. The assignment of the connectors is IGC-compliant (see figure 2). The assignment of the output is also IGC-compliant.
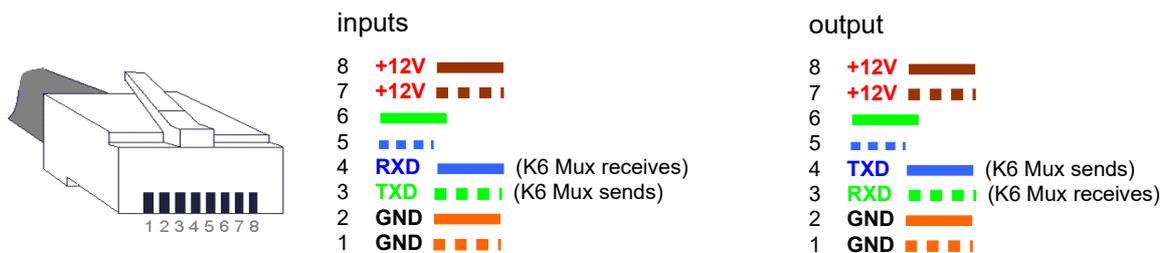

inputs

8	**+12V**	
7	**+12V**	
6		
5		
4	**RXD**	(K6 Mux receives)
3	**TXD**	(K6 Mux sends)
2	**GND**	
1	**GND**	

output

8	**+12V**	
7	**+12V**	
6		
5		
4	**TXD**	(K6 Mux sends)
3	**RXD**	(K6 Mux receives)
2	**GND**	
1	**GND**	

1 2 3 4 5 6 7 8

figure 2: Wiring RJ45 (IGC-compliant)
Note: the IGC published numbering of contacts is mirrored to the normal numbering.

On all in- and outputs the following transmission rates are supported: 2400, 4800, 9600, 19200, 38400, 57600, 115200.

1.2 LEDs

The K6 Mux outputs the operating status with two LEDs.
- continuous light of the green LED in the first 4 seconds after power on (——): Ready for configuration
- red LED blinks (- -): automatic baud rate identification (see chapter 1.4) activated and baud rate not found yet
- red LED off: baud rate found or constant setting
- green LED flashes (· ·): „flight" mode (see chapter 2.1)
- green LED blinks (- -): „communication" mode (see chapter 2.2)

1.3 Jumpers

Remove the screws and open the housing to get access to the circuit board. The circuit board itself can remain in the housing during configuration.

See figure 3 for a drawing of the circuit board with its jumpers:

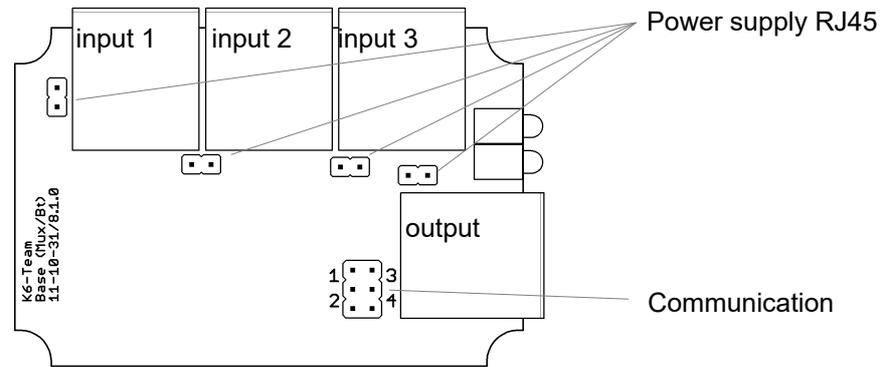| Jumper	Function	
	bridged	unbridged
Power supply	Power supply over chosen connection port	No power supply over chosen connection port (at least one jumper has to be set!)
Communication	Backup configuration for flight mode or „Communication" mode (see chapter 3.3)	„Flight" mode

figure 3: K6 Mux 2 circuit board with jumpers

1.4 Power supply

The power has to be supplied over at least one of the inputs or the output. A common fuse with one of the connected devices is sufficient. In this case the fuse specified for the connected device has to be used. Otherwise, use a 1A fuse for K6 Mux.

The power supply pins of all in- and outputs can be connected over the jumpers as shown in figure 3.

1.5 Automatic baud rate identification, reautobaud.

The K6 Mux can detect the baud rate of the with the inputs connected devices. Detection of the baud rate is only possible when the connected device sends NMEA-0183 conforming data with at least one sentence per second. If data transmission breaks or the data source is changed, may be searched an other baud rate.

2 Operation modes "flight" and "communication"

The operation mode of the K6 Mux can be selected over a switch connected to the direct communication jumper. With the switch open the „flight" mode with the standard configuration „A" is preset. The switch settings can be configured for three (with standard switch) or five (two switches or rotary switch) modes.

Switch setting	Flight	1	2	3	4
Configuration					

2.1 Mode of operation „flight"

In this operation mode, the received data at the inputs are filtered, combined and sent over the output to the connected device. Besides it is possible to forward data beween the inputs. Additionally to the standard configuration „A" a backup configuration „B" for this mode can be set up.
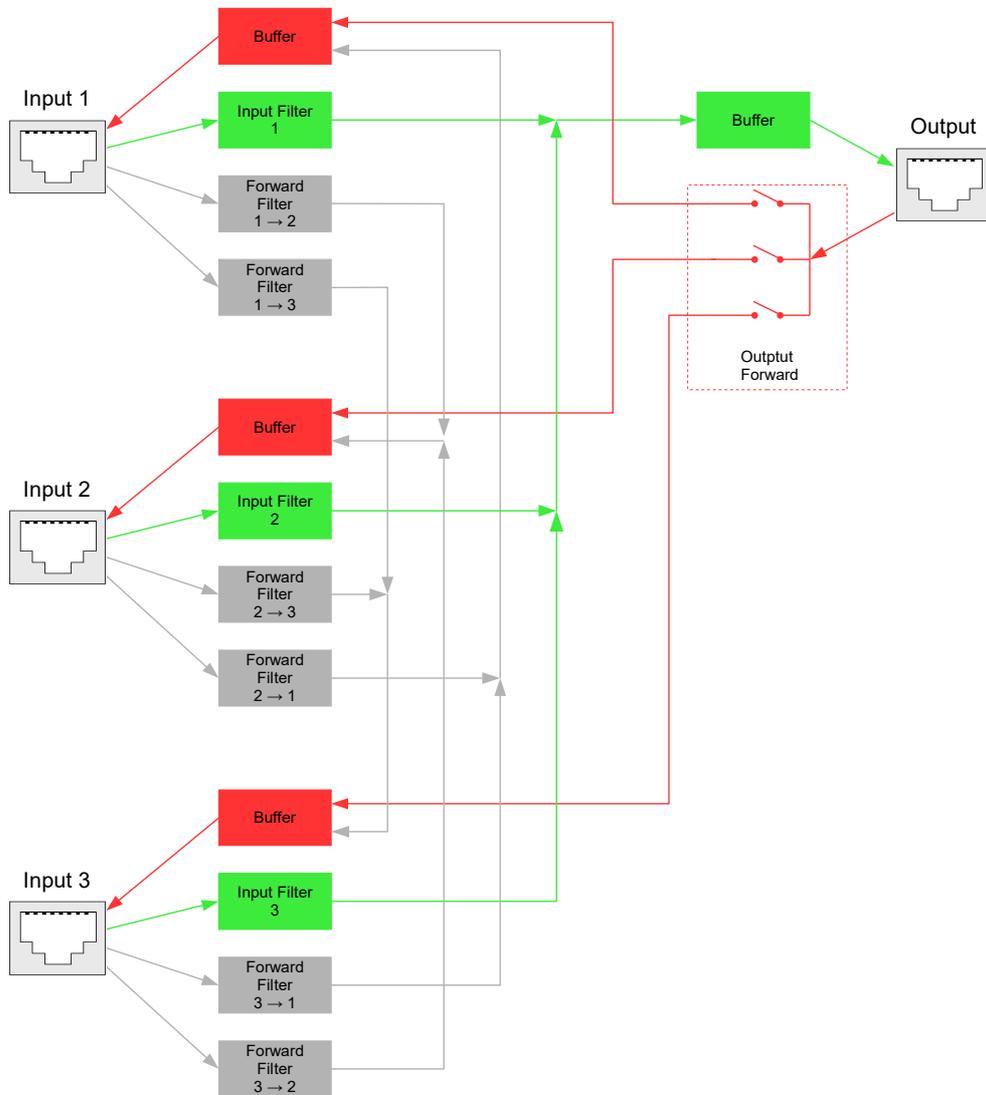

figure 4: data processing during „flight" mode

2.2 Mode of operation „communication"

Switch the K6 Mux in this mode with the communication switch for direct communication between two devices. Thus, it is possible to declare and download flight recorders. Each oft the six combinations of input and output jacks is possible.

All filter options and baud rate conversion are deactivated in this mode. Thus, it is necessary to set the same baud rate at the two direct connected devices.

3 Configuration

The configuration of K6 Mux can be set up over the serial port at the output.

Therefore a terminal program (e.g. Hyperterminal which comes with MS Windows, for further terminal programs see appendix) and an IGC-compliant cable to a PC (usual for Flarm, Volkslogger, Colibri and other flight recorders) are needed.

The following connection has to be set up at terminal program:

baud rate: 115200 baud, data bits: 8, parity: none, stop bits: 1, flow control: no

After applying the power supply to the K6 Mux, the string 'ikkk' (+ one second pause) has to be entered in the terminal program within 4 seconds (while the LED is continuously on).

The K6 Mux starts with the main menu:

```
K6-Team K6 Mux HW 8.1.0, FW 4.2 build 2012-11-14

  - Main -
+----------------------------------------------+
| 1: Inputs/Output baudrates                   |
| 2: Filters and Forwarding                    |
| 3: Switch configurations                     |
+----------------------------------------------+
| 4: Set new configuration by text             |
| 5: Dump current configuration                |
+==============================================+
| S: Exit setup, start Mux                     |
+----------------------------------------------+
```

The shortcuts '1' to '5' lead to the in the following subchapters described submenus.

Shortcut	Function	Description
1	Input / Output baudrates	Configuration of baud rate the data in- and outputs during mode of operation „flight"
2	Filters and Forwarding	Configuration filter and forwarding options for the three data inputs during mode of operation „flight"
3	Switch configurations	Configuration of comunication switch settings
4	Set new configuration by text	Direct configuration of K6 Mux via text input
5	Dump current configuration	Show actual configuration of K6 Mux as text
S	Exit	Reset K6 Mux with current configuration

3.1 Output (mode of operation „flight")

In this operation mode, the received data at the inputs are filtered, combined and sent over the output (see green path at fig. figure 4). The transfer rate can be set unique for each of the three inputs. Particulary if devices with changeable baud rate are connected (e.g. Flarm) it is recommended to set the baud rate automatically.

Access the submenu for the output in „flight" mode via the shortcut '1'. The K6 Mux displays the possible options:

```
   - Port baudrates -
+-------------------------+
| 1: Input 1:    auto     |
| 2: Input 2:    4800     |
| 3: Input 3:    4800     |
+=========================+
| 4: Reautobaud:   5 sec  |
+=========================+
| 5: Output:     19200    |
+=========================+
```

Chose the baud rate for the data output. To to prevent data loss by combining data from up to three devices, it makes sense to choose a higher data transfer rate for the output than on the inputs. The standard baud rate is 19200 baud.

Shortcut	Function	Description
1, 2 ,3, 4, 5	Baud rate	Configuration of transfer rate at data output. *Shortcuts with options::* *1: 2400 baud* *2: 4800 baud* *3: 9600 baud* *4: 19200 baud* *5: 38400 baud* *6: 57600 baud* *7: 115200 baud* *8: auto (only at inputs)* *Reautobaud: Only for inputs with autobaud. New search after delay in seconds.* *1: disabled* *2: 5 sec* *3: 10 sec* *4: 30 sec*
X	Back	Back to the main menu

3.2 Data forwarding and filter options

After input of shortcut '2' at the main menu the K6 Mux shows the forwarding and filter options of the three data inputs. Two configurations „A" (standard) and „B" (backup) can be setted. To set the backup configuration „B" more comfortable, it is possible to copy the complete standard configuration „A" via the shortcut „'7'. The following screen dump shows the configuration in delivery configuration:

```
   - Filters and Forwarding -
+---------------------------------------------+
| Filter setup A (default)                    |
+---------------------------------------------+
| 1: Input filters (Inputs -> Output)         |
| 2: Input forwarding filters (Input -> Input)|
| 3: Output forwarding (Output -> Input)      |
+=============================================+
| Filter setup B                              |
+---------------------------------------------+
| 4: Input filters (Inputs -> Output)         |
| 5: Input forwarding filters (Input -> Input)|
| 6: Output forwarding (Output -> Input)      |
+=============================================+
| 7: Copy filter setup A -> filter setup B    |
+=============================================+
| X: Back                                     |
+---------------------------------------------+
```

Input the related shortcut to change a parameter. Different options will be displayed and further shortcuts can be used for configuration. The following options are changeable:

Shortcut	Function	Description
1, 4	Filter options at inputs	Configuration of filter options at inputs 1 to 3. See chapter 3.2.1
2, 5	Data forwarding between inputs	Configuration of data forwarding beween the inputs. See chapter 3.2.2
3, 6	Data redirection from output	Configuration of data redirection from output to inputs. See chapter 3.2.3
7	Copy configuration	Copy the standard configuration „A" to the backup configuration „B"
X	Back	Back to the main menu

3.2.1 Filter options

Freely configurable filters can be set to the required records. Unwished data sentences from the connected devices can be filtered using the sentence filter. This filter is configurable unique for each input.

Generally it is reasonable to accept a specific data sentence only from one device, if it is sent by multiple devices.

Access the filter options from the data forwarding and filter options menu (chapter 3.2) with the shortcut '2' (for standard configuration „A") or '5' (for backup configuration „B").The K6 Mux answers with the actual setting of the respective configuration:

```
 - Input filters (A) -
+----------+----------+----------+----------+
|          |  Input 1 |  Input 2 |  Input 3 |
+----------+----------+----------+----------+
| Filter   | [1: Edit]| [2: Edit]| [3: Edit]|
| NMEA     |   Yes    |   No     |   No     |
| Cksum    |   No     |   No     |   No     |
| Mode     |   Pass   |   Block  |   Block  |
+----------+----------+----------+----------+
| Sentences| "$PFL"   |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
|          |  ""      |  ""      |  ""      |
+==========+==========+==========+=========+
| X: Back                                  |
+------------------------------------------+
```

Access the filter configuration via the shortcuts '1', '2' and '3' for the respective input to get the following options to change the setting:

```
 - Input filter 1 (A) -
+----------------+
| 1: NMEA : Yes  |
| 2: Cksum: No   |
| 3: Mode : Pass |
+----------------+
| A: "$PFL"      |
| B: ""          |
| C: ""          |
| D: ""          |
| E: ""          |
| F: ""          |
| G: ""          |
| H: ""          |
| I: ""          |
| J: ""          |
+================+
| X: Back        |
+----------------+
```

Shortcut	Function	Description
1	NMEA	Activate/deactivate NMEA filter at inputs 1 to 3 *With activated NMEA filter all NMEA-non-compliant data sentences will be filtered out. A line with a NMEA-compliant data sentence begins with the character '$' and closes with <CR><LF>*
2	Cksum	Activate/deactivate checksum filter at inputs 1 bis 3 *With activated checksum filter, sentences without or with wrong checksum will be filtered out*
3	Mode	Configuration of sentence filter. Details below this table. *Shortcuts with options:* 0*: none (sentence filter)* 1*: Pass (only listed sentences will pass the filter, all other sentences will be filtered out)* 2*: Block (all listed sentences will be filtered out)*
A to J	Sentence labeling	Labeling for the filtered sentences. Details below this table
X	Back	Back to the filter overview

In the list of sentences there are up to ten sentence names for the filter listed. A name for a filter consists of maximal six characters.

The filter analyses from each received sentence the first characters and compares them with the names wich are stored in the list of sentence. Depending on the configuration under „mode" the filter forwards or deletes the incoming sentence.

3.2.2 Input data forwarding

In delivery condition no forwarding is configured. The grey path in fig. figure 4 shows the data forwarding of the different inputs to the other two inputs. Like the normal data output the data are combined, filtered and the transmission speed is adjusted. Thus, for example an ELT or a computer can receive GPS data from a Flarm without the Flarm collision data, while a PDA receives all the output data. The data transfer between the inputs is fully configured through the filter options described in chapter 3.2.1, the „deactivation" of the forwarding results from the blocking of all data sentences. Use this menu to configure data forwarding between the inputs during „flight" mode. In delivery configuration no input forwarding is set.

First, the K6 Mux displays the choices of all six possibilities of forwarding:

```
  - Input forwarding filters (A)  -
+---------------------------------------------+
| 1: Filter Input 1 -> Input 2                |
| 2: Filter Input 1 -> Input 3                |
| 3: Filter Input 2 -> Input 3                |
| 4: Filter Input 2 -> Input 1                |
| 5: Filter Input 3 -> Input 1                |
| 6: Filter Input 3 -> Input 2                |
+=============================================+
| X: Back                                     |
+---------------------------------------------+
```

Shortcut	Function	Description
1 to 6	Filter	Configuration of the respective input forwarding option 1: *Input 1 → Input 2* 2: *Input 1 → Input 3* 3: *Input 2 → Input 3* 4: *Input 2 → Input 1* 5: *Input 3 → Input 1* 6: *Input 3 → Input 2*
X	Back	Back to the main menu

See the configuration of the respective input forwarding occurs the same way as in chapter 3.2.1 described. In delivery condition all forwardings are blocked by the use of the filter mode „pass" with an empty data sentence list.

It is recommended to forward only necessary sentences.

3.2.3 Data redirection from output to inputs

During the operation mode "flight", the K6 Mux is able to send data from receiving device (connected to the output jack) to one, two or all the three inputs. Thus, it is possible to control an e-vario or flarm device. If multiple output forwardings are set, the data of the output are sent to all activated inputs. Unlike the data transmission from inputs to the output and the input forwarding, the data is not processed line by line and not filtered. In case of silmutaneous activated input-to-input forwarding it is possiblie to loose data under certain circumstances. In fig. figure 4 the red path shows the output data forwarding.

Starting this menu the K6 Mux shows the following options:

```
 - Output forwarding (A) -
+----------------------------------+
| 1: Forward output to Input 1: yes |
| 2: Forward output to Input 2: no  |
| 3: Forward output to Input 3: no  |
+==================================+
| X: Go back                       |
+----------------------------------+
```

Change the activation status of each redirection via the shortcuts '1', '2' or '3'.

3.3 Configuration of communication switch

In this menu the communication switch settings can be configured. With open switch the K6 Mux stands in „flight" mode standard configuration „A". For detailed description see chapter 2.2.

Access this menu from main menu with the shortcut '3', the K6 Mux displays for each switch setting the communication configuration.

```
 - Switch Configuration -
+--------------------------------------------------------+
| 1: Switch pos 1: Direct connection "Output  <-> Input 1" |
| 2: Switch pos 2: Direct connection "Output  <-> Input 2" |
| 3: Switch pos 3: Direct connection "Input 2 <-> Input 3" |
| 4: Switch pos 4: Switch to filter setup B              |
+========================================================+
| X: Back                                                |
+--------------------------------------------------------+
```

The allocation for each switch setting is configurable over the corresponding shortcut.

Shortcut	Function	Description
1 to 4	Switch configuration	Allocation between switch setting and operation mode 1: *switch setting 1*, 2: *switch setting 2*, 3: *switch setting 3*, 4: *switch setting 4*
X	Back	Back to the main menu

After the input of the to configured switch setting the wished direct communication path will be allocated with a further shortcut.

Shortcut	Description
1	Direct communication path between output and input 1
2	Direct communication path between output and input 2
3	Direct communication path between output and input 3
4	Direct communication path between input 1 and input 2
5	Direct communication path between input 2 and input 3
6	Direct communication path between input 3 and input 1
7	„Fligt" mode with backup configuration „B"

3.4 Configuration by the input of text

The K6 Mux 2 can output and read the complete configuration as text. Thus it is possible to backup a configuration or copy it to another K6 Mux 2. This feature is new for K6 Mux 2, exchange with a K6 Mux from previous generation is not possible.

Use the shortcut '5' to display the actual configuration:

```
# Current configuration:
load_default
output_baud = 19200
.
.
.
input3_f2_filter_sentences_clear
save
end
# Done. Press any key to continue...
```

To store the configuration copy and paste the text in a text file.

With the reverse way it is possible to set up an configuration. Copy the text from file and paste it after entering the shortcut '4'. Most of terminal programs support also the direct upload of a text file. Example:

```
# Current configuration:
load_default
output_baud = 19200
output_forward_to_input1 = 0
output_forward_to_input2 = 0
output_forward_to_input3 = 0
output_forward_to_input1_B = 0
output_forward_to_input2_B = 0
output_forward_to_input3_B = 0
input1_baud = auto
input1_filter_nmea = 1
input1_filter_cksum = 0
input1_filter_type_block = 0
input1_filter_sentences_clear
input1_filter_sentence = "$PFLA"
input1_f2_filter_nmea = 0
```

```
input1_f2_filter_cksum = 0
input1_f2_filter_type_block = 0
input1_f2_filter_sentences_clear
input1_f3_filter_nmea = 0
input1_f3_filter_cksum = 0
input1_f3_filter_type_block = 0
input1_f3_filter_sentences_clear
input1_filter_nmea_B = 0
input1_filter_cksum_B = 0
input1_filter_type_block_B = 0
input1_filter_sentences_clear_B
input1_f2_filter_nmea_B = 0
input1_f2_filter_cksum_B = 0
input1_f2_filter_type_block_B = 0
input1_f2_filter_sentences_clear_B
input1_f3_filter_nmea_B = 0
input1_f3_filter_cksum_B = 0
input1_f3_filter_type_block_B = 0
input1_f3_filter_sentences_clear_B
input2_baud = 4800
input2_filter_nmea = 0
input2_filter_cksum = 0
input2_filter_type_block = 1
input2_filter_sentences_clear
input2_f3_filter_nmea = 0
input2_f3_filter_cksum = 0
input2_f3_filter_type_block = 0
input2_f3_filter_sentences_clear
input2_f1_filter_nmea = 0
input2_f1_filter_cksum = 0
input2_f1_filter_type_block = 0
input2_f1_filter_sentences_clear
input2_filter_nmea_B = 0
input2_filter_cksum_B = 0
input2_filter_type_block_B = 0
input2_filter_sentences_clear_B
input2_f3_filter_nmea_B = 0
input2_f3_filter_cksum_B = 0
input2_f3_filter_type_block_B = 0
input2_f3_filter_sentences_clear_B

input2_f1_filter_nmea_B = 0
input2_f1_filter_cksum_B = 0
input2_f1_filter_type_block_B = 0
input2_f1_filter_sentences_clear_B
input3_baud = 4800
input3_filter_nmea = 0
input3_filter_cksum = 0
input3_filter_type_block = 1
input3_filter_sentences_clear
input3_f1_filter_nmea = 0
input3_f1_filter_cksum = 0
input3_f1_filter_type_block = 0
input3_f1_filter_sentences_clear
input3_f2_filter_nmea = 0
input3_f2_filter_cksum = 0
input3_f2_filter_type_block = 0
input3_f2_filter_sentences_clear
input3_filter_nmea_B = 0
input3_filter_cksum_B = 0
input3_filter_type_block_B = 0
input3_filter_sentences_clear_B
input3_f1_filter_nmea_B = 0
input3_f1_filter_cksum_B = 0
input3_f1_filter_type_block_B = 0
input3_f1_filter_sentences_clear_B
input3_f2_filter_nmea_B = 0
input3_f2_filter_cksum_B = 0
input3_f2_filter_type_block_B = 0
input3_f2_filter_sentences_clear_B
switch1 = dc_out-in1
switch2 = dc_out-in2
switch3 = dc_in2-in3
switch4 = filter_b
reautobaud = 5
vport_mode = 0
save
end
# Done. Press any key to continue...
```

4 Technical data

Demensions	ca. 72x50x28mm³
Connection ports	3x input RJ45 IGC-compliant 1x output RJ45 IGC-compliant
Power supply	5 to 15V by one of the connection ports • configurable with jumpers • reverse voltage protection (not for connected devices!) • fuse 0.5 up to 2A
Current drain	ca. 40mA
Transfer rates	2400, 4800, 9600, 19200, 38400, 57600, 115200 baud automatic baud rate identification for NMEA0183-compliant data sets on inputs. Reautobaud.

5 Support

K6-Team
Ihn. Ingrid Rüth

B.-v.-Linsenmann-Str. 7
72108 Rottenburg
Deutschland

http://www.k6-team.de
E-Mail: service@k6-team.de

Please do not put old devices into the garbage, return it to us.
After the EU FAQ list the devices which are intended specially to the application in means of transportation are excluded from the range of application of the RoHS directive and with it from § 5 ElektroG.
Of course the K6 Mux 2 is soldered lead-free.

> **Warning:**
> K6 Mux 2 may loose NMEA data sets. Never rely entirely on the indication of your end device. Airspace observation is essential!

6 Suffix

6.1 Terminal programms for configuration

- **Teraterm** (Windows 98/2000/XP/Vista/7)
  free, download at http://sourceforge.jp/projects/ttssh2/
- **pockeTTy** (Windows Mobile / Windows CE)
  Shareware, download at http://www.dejavusoftware.com/pocketty
- **Connection Terminal** (Android over Bluetooth)
  OpenSource, Download at Google Play Store