DUPLEX Rx

The DUPLEX line of receivers is intended to work with DUPLEX Tx transmitter modules in the 2,4GHz band. Thanks to the fully digital and bidirectional communication between transmitter and receiver there arise completely new aspects in the model remote control branch. One of the most important advantages is the operation without crystal, moreover the low susceptibility towards interference, the high range up to the limit of visibility and the possibility to follow anytime the onboard state of the model and its functional parts.

An additional satellite receiver RSat complements the receivers R14 and R18. This receiver is a full DUPLEX system receiver offering the complete functional spectrum of the system. Instead of classical servo pulses the output of the RSat receiver offers a PPM signal only. This PPM signal is furtheron processed by the receivers R14/R18 or by compatible RC equipment which requires a PPM signal at the input.

DUPLEX-Receivers:

Basic Data	DUPLEX R14	DUPLEX R18	DUPLEX RSat
Dimensions	62x38x16mm	62x38x16mm	27x20x4mm
Weight	30g	30g	10g
Antenna Length	2x 400 mm	2x 400 mm	2x 200 mm
Number of Outputs	14	18	PPM 16
Operation Temperature	- 10 až + 85°C	- 10 až + 85°C	- 10 až + 85°C
Supply Voltage	3,2 – 8,4V	3,2 – 8,4V	3,2 – 8,4V
Average Current	40 mA	40 mA	35 mA
Real Time Telemetric Data Transfer	●	●	●
Programming	JETI BOX	JETI BOX	JETI BOX
Support of Satellite Receivers	YES	YES, 1x RSat contained in package	No
Max. Power Output	20 dBm	20 dBm	6 dBm
Sensitivity	-106 dBm	-106 dBm	-98 dBm

Current Supply:

The vital receiver current supply can be realized either by application of NiCd batteries, by stabilized voltage supplies provided by controllers (electric flight) or by Li-xx cells via stabilizers like the MAX BEC. But it is of utmost importance to keep always the allowed supply voltage range of the receiver and servos in mind. If all servo connectors are engaged by servos an Y-cable can be used for current supply. The supply batteries of the BEC or the Y-cable can be connected to any arbitrary receiver output, but do by no means use the output marked Ext. for receiver current supply purposes.

The receivers R14 and R18 are equipped with a separate MPX supply connector. We recommend to use this connector for the receiver current supply and servos because of its high current load capability and reliability.

Operation:

Operation of the DUPLEX system is very similar to a FM system. We recommend switching on the transmitter first and thereafter the receiver. The transmitter confirms switching on of the receiver by a short beep. When switching off the system we recommend to switch off the receiver first and after that the transmitter.

DUPLEX Rx

Installation:

Wrap the receiver with soft foam and position it as far as possible away of interference sources (servos, electric motors). Place the active ends of the antennas with an angle of 90° inbetween and as far away as possible of each other. The minimum bending radii of the antenna cables should not be smaller than 1 cm. The active parts of the antenna must remain straight and should be kept as far off as possible of metal parts. If the model fuselage consists of carbon fibre the active antenna parts should protrude through the fuselage wall to the outside.

Pairing:

Before using a new receiver or transmitter they must be first of all bilaterally paired. The information flow between receiver and transmitter occurs on a full digital basis, therefore the equipment which is mutually communicating in a common frequency band must be equipped with an address. Pairing (addressing of the equipment) is realized by plugging in of the so called BIND PLUG into the connector for external equipment marked Ext. and by switching on the receiver. After that the transmitter is switched on and confirms pairing with the receiver by a double beep. Remove the bind plug from the receiver. The transmitter draws attention to the presence of a bind plug in the receiver by acoustic signals.

It is also possible to perform pairing without BIND PLUG with aid of the JETIBOX. In that case the JETIBOX must be connected directly to the receiver. Select at the JETIBOX the position (pairing) and push the key U (arrow up). The receiver is waiting now for switching on of the transmitter with which pairing shall be carried out. The transmitter reports pairing by a double beep and everything is ready for operation. Should pairing be unsuccessful, switch off transmitter and receiver and repeat the whole procedure as described formerly.

It is possible to pair an arbitrary number of receivers to one transmitter. The receiver itself can be paired to one transmitter only, that means that the receiver is paired to that transmitter to which it has been paired eventually.

Telemetric Data Transfer in Real Time:

Any receiver allows transfer of the actual on board system voltage, that means of the receiver voltage without telemetric sensors.

It is possible to connect a telemetric sensor directly to the receiver connector marked (Ext.). If you wish to use several sensors you may take advantage of the expander DUPLEX Ex which must in that case be connected to the receiver connector (Ext.).

Alerting in Case of Bidirectional Signal Loss:

In case of loss of bidirectionel communication between transmitter and receiver the transmitter DUPLEX module reports this event by acoustic signals. This situation means that at the given instant there are no data available of telemetric sensors or equipment connected to the receiver input (Ext.). But the model can in this situation still be controlled.

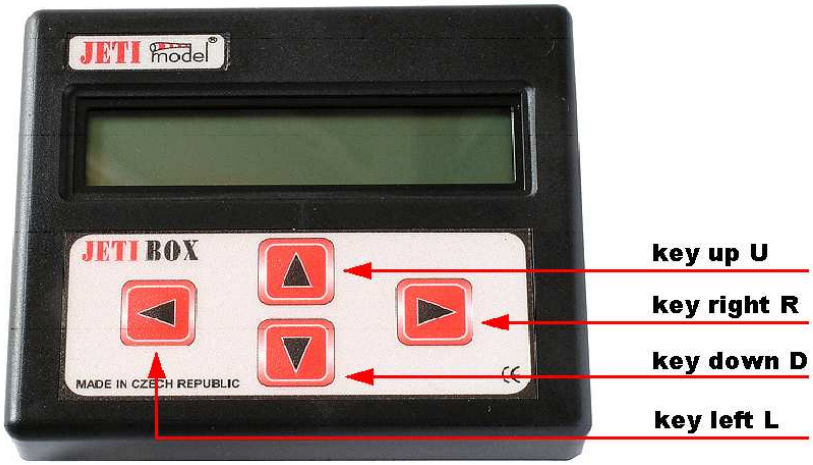
Warranty:

For this product we grant a warranty of 24 months from the day of purchase under the assumption that it has been operated in conformity with these instructions at recommended voltages and that it has not been damaged mechanically. Warranty and post warranty service is provided by the manufacturer.

We wish you sucessful flying with the products of:
Jetimodel s.r.o. Příbor, www.jetimodel.cz

DUPLEX Rx

Communication with the DUPLEX Receiver with aid of the JETIBOX



The JETIBOX can be connected to the receiver in two ways:

1. By direct connection JETIBOX <-> receiver

Plug the connector of the interconnecting cable (enclosed in the JETIBOX package) into the receptacle marked **Impuls + -** (positioned at the right side of the **JETIBOX**) and the other end into the receiver receptacle marked Ext. Connect the current supply to the receiver (see current supply) or to the current supply receptacle of the JETIBOX.

2. By wireles connection JETIBOX <-> transmitter <-> receiver

In that case the JETIBOX must be connected to the transmitter. Switch on the transmitter and connect the current supply of the receiver.

The display shows the text Tx and arrows to the right and down. You may enter the receiver menu by pushing the key **R** (arrow right), the display shows the text Rx and after that you enter the receiver menu by pushing key **D** (arrow down). The display picture corresponds to the picture as shown in case of direct connection (see item 1).

Wireless connection with the receiver is possible in Normal mode only. If you would during wireless connection change from Normal mode to Clone mode, the receiver would switch to monitoring mode and the JETIBOX would stop to respond. In order to renew communication with the receiver the JETIBOX will have to be reconnected to the receiver directly, see item 1. In case of using a receiver which has before been working in monitoring mode (Clone) in an other model, do not forget to set it back to the original mode (Normal).

The JETIBOX can be disconnected only after the receiver has been also disconnected from its voltage supply. **It is anytime possible to follow up the condition of the receiver or to set up its parameters even during its operation in the model, but this ought to be done very carefully. Setups should be carried out only if security of the model against damage and of persons against injury is warranted.** As an important safety measure an accidental motor start should be prohibited by all means, removing the propeller from the model might be very helpful!

DUPLEX Rx

Communication with the DUPLEX Expander with aid of the JETIBOX (JB):

Plug the connector of the interconnecting cable (enclosed in the JETIBOX package) into the receptacle marked (Rx) at the back of the expander and the other end into the receptacle of the receiver marked (Ext.). Connect the JETIBOX to the transmitter module. Switch on the transmitter and connect the current supply to the receiver (see current supply). In the JETIBOX display there appears the text Tx and by pushing key R (arrow right) twice you will select the item Mx. By pushing key **D** (arrow down) you will enter the expander menu. **The main menu (selection of the connected device Tx, Rx, Mx) will be attained by holding down key U (arrow up) for a longer time).**

Overview of Receiver Data Items

The introductory display shows the type of receiver. By pushing of key R (arrow down) more detailed data of receiver and transmitter can be cued.

Pairing: by pushing key U (arrow up) pairing of the receiver with the transmitter will be executed. Pairing of the receiver should only be carried out when the JETIBOX is directly connected to the receiver.

RX/TX: Item RX shows the unic production number of the receiver. Item TX shows the unic production number of the transmitter, to which the receiver has eventually been paired.

Rx Diag: Item A1 or A2 shows which antenna the receiver is using at present. Item Kx informs about the number of transferred channels (this number depends of the transmitter abilities).
By means of key **D** (arrow down) you arrive at the line of basic mode selections, where you may select read out of measured values (**Measure**) or setup of the receiver (**Main setting, Channel set, Out Pin Set, Auto Set**).

Measure: enables read out of measured data of the maximum, minimum and actual receiver voltage.

- ***Volt Min / Act / Max*** : the receiver is checking the supply voltage and indicates limit values and extremes which occurred during operation; at the same time it also shows the actual receiver voltage. Without switching on the paired transmitter the values MAX and MIN will not change, only the value of the actual voltage ACT will be updated. In order to delete values MAX and MIN, keys L (arrow left) and R (arrow right) must be pressed simultaneously.

Main setting: Basic setup, here you may adjust general properties of the receiver which are common to all output channels.

- ***Signal Fault Delay***: (valid for receivers R14 and R18 only) specifies the deadline after which the receiver outputs change due to signal loss to preadjusted positions of the particular outputs or after which they become switched off (due to setup of ***Signal Fault*** in the menu **Out Pin Set**).
- ***Volt act/alarm***: the first item shows the actual receiver voltage, the second value serves for the setup of the alert decision threshold. As soon as during operation the actual voltage decreases below the set threshold, the transmitter will announce this situation by an acoustic tone.

DUPLEX Rx

- ***Output Period***: setup of the output signal period (standard setup 20ms), analog servos respond faster with lower values (shorter response time) and consume more current. If the value is set too low some servos may chatter. The output period may also be synchronized with the transmitter - ***Output Period*** - *By Transmitter.*
- ***RX mode***: this setup switches the receiver to monitoring mode (Clone). This mode should only be used in applications with two or more receivers, working simultaneously in a model in connection with a single transmitter module. One receiver should work as master receiver (Normal) and the others in monitoring mode (Clone). The mode change (Normal / Clone) must be carried out only with the JETIBOX connected directly to the receiver. **Telemetric sensors can be operated with a receiver in Normal mode only.**
- ***PPM Output mode*** (applicable to RSat receivers only) Setup of the satellite receiver mode
  - **Computed**: the signals received from the transmitter can be processed furtheron in the receiver and its menus *Channel set* and *Out Pin Set* (mixers, programmable channel outputs a.s.o.)
  - **Direct**: signals received from the transmitter are **not** furtheron processed in the receiver, they are generated without any change at the output of the sallite receiver in form of PPM signals

Channel set: parameter setup of (received) individual input channels *CH*

- ***Set Input Channel***: selection of the input channel which has to be set up, value A represents the actual throw of the selected input channel.
- ***Set Center***: neutral position setup of the input channel, this parameter is important for further processing of mixers, reverse, gain etc.
- ***Mix CHa and CHb***: makes mixing of the selected channel with another channel feasible.
- ***Mix Relation***: setup of the mixing ratio, the mixed channel always features a ratio of 50 %. For instance, mixing of CHa and CHb with a ratio of 100% = 50% CHa and 50% CHb, a ratio of 50% = 50% CHa and 25% CHb, a ratio of 200% = 50% CHa and 100% CHb.
- ***Mix Sign***: the first sign of the mixed channel specifies whether the channels are subtracted or added

Out Pin Set: Relation of functions to individual output channels (pins) Y of the receiver.

- ***Set Output Pin***: Selection of the output channel whose setup you want to show or change. It is possible to add to a R14/R18 receiver two satellite receivers or further R14/R18 receivers. In case of the Duplex R18 receiver it is possible to switch output Y17 to the function Sat1 and output Y18 to Sat2. The output channel marked Sat 2 may be set to receiving mode or to generation of PPM signals. This function is of use in case of a bidirectional connection of several receivers or satellite receivers. The output channel marked Sat 1 can be set to PPM signal mode only.
- **Set mode SAT:** on the Duplex R14 receiver the outputs SAT1 and SAT2 can be affiliated with following functions
  - PPM Off: the particular output is neither generating nor receiving a PPM signal
  - PPM Input: the particular input is expecting a PPM signal of the connected receiver
  - PPM Output: the receiver will generate PPM signals on output SAT2

- **Set mode SAT:** on the Duplex R18 receiver the outputs SAT1 and SAT2 can be affiliated with following functions
  - CH xx: the PPM signal on the particular output will neither be generated nor received. The output has the same function like the outputs Y1-Y16.
  - PPM Input: the particular input is expecting a PPM signal of the connected receiver
  - PPM Output: the receiver will generate PPM signals on the output SAT2
  - PPM Alarm Code: if one of the outputs SAT1/2 is set to PPM input mode, an acoustic signal can be set up which reports absence of the connected signal. By means of loading a morsealphabet character tones are set, which acoustically announce the absence of the PPM signal at the particular receiver input. These acoustic signals are generated by the transmitter module.

- ***Set Input Channel***: function affiliation to particular outputs, any input channel or its mixing product which may be specified in the menu **Channel Set** can be set up.
- ***Reverse A***: makes throw reverse at the output in the half plane A possible, the half planes are subdivided according to the neutral position setup (**Channel set - *Set Center***)
- ***Reverse B***: makes throw reverse at the output in the half plane B possible
- ***Gain A***: Amplification of the output throw in half plane A (100% - without changes)
- ***Gain B***: Amplification of the output throw in half plane B (100% - without changes)
- ***Signal Fault***: setup of the receiver behaviour in case of signal loss, *repeat*- repetition of the last valid throw positions, *out off* – output switched off, *FailSafe* – transition to preset throw positions of individual outputs which may be set up in the ***FailSafe*** menu.
- ***FailSafe***: throw setup of a selected output in case of signal loss
- ***Delay***: delay of servo speed (at the output) in case of a change at the input, the entry time corresponds with the transit time within the output range between 1ms to 2ms which, for instance, may be suitable for retracting a landing gear
- ***Curve***: Setup of a channel output curve
- ***ATV High Limit***: restriction (reduction) of the maximum throw of a particular output (half plane B)
- ***ATV Low Limit***: restriction (reduction) of the maximum throw of a particular output (half plane B)
- ***Output Group***: setup of a particular output for a selected group of output pulses, which are generated by the receiver at the same time . See page 9.

DUPLEX Rx

Auto Set: complete receiver preset for predefined functions. After selection of the desired function the receiver setup is executed by simultaneous pressing of the left and right JETIBOX keys for about 3 seconds.

- ***Normal***: basic setup, mixers switched off, individual input channels are affiliated to corresponding outputs, i. e. input *CH1* is affiliated to output *Y1* etc.
- ***MixCH1&CH2 Elevon***: affiliates the mix of the received CH1 and CH2 to the output channels *Y1* and *Y2*
- ***MixCH2&CH4 V-Tail***: affiliates the mix of the received CH2 and CH4 to the output channels *Y2* and *Y4*

Auto Set – ***Normal*** = default setup, all received channels *CH* will be transferred without change to corresponding outputs Y, that means the receiver behaves lik a classical non programmable receiver.

Channel Set				
SetInputChannel CHx	**Set Center**	**Mix CHx and CHy**	**Mix Relation**	**Mix Sign**
CH1	1,5ms	CH1 and CH1	100%	+
CH2	1,5ms	CH2 and CH2	100%	+
CH3	1,5ms	CH3 and CH3	100%	+
CH4	1,5ms	CH4 and CH4	100%	+
CH5	1,5ms	CH5 and CH5	100%	+
CH6	1,5ms	CH5 and CH6	100%	+
CH7	1,5ms	CH7 and CH7	100%	+
CH8	1,5ms	CH8 and CH8	100%	+

Out Pin Set													
Set Output Pin	**SetInChannel**	**Reverse A**	**Reverse B**	**Gain A**	**Gain B**	**Signal Fault**	**FailSafe**	**Delay**	**Curve**	**ATV HighLimit**	**ATV LowLimit**	**Output Trim**	**Output Group**
Y1 bis Y18	CH1 bis CHx	off	off	100%	100%	Fail Safe	1,5ms	0s	linear	2,0ms	1,0ms	0,0ms	A

Examples of receiver setups:

1)

The receiver outputs will be programmed in such a manner that outputs Y1, Y2 and Y3 will be affiliated with the same transmitter function. Servos connected to these inputs will be steering the same control device (for instance the elevator) and will be coupled mechanically. On the transmitter is this function affiliated with the first channel CH1.

Out Pin Set													
Set Output Pin	**SetInChannel**	**Reverse A**	**Reverse B**	**Gain A**	**Gain B**	**Signal Fault**	**FailSafe**	**Delay**	**Curve**	**ATV HighLimit**	**ATV LowLimit**	**Output Trim**	**Output Group**
Y1	CH1	off	off	100%	100%	Fail Safe	1,5ms	0s	linear	2,0ms	1,0ms	0,0ms	A
Y2	CH1	off	off	100%	100%	Fail Safe	1,5ms	0s	linear	2,0ms	1,0ms	0,0ms	A
Y3	CH1	off	off	100%	100%	Fail Safe	1,5ms	0s	linear	2,0ms	1,0ms	0,0ms	A

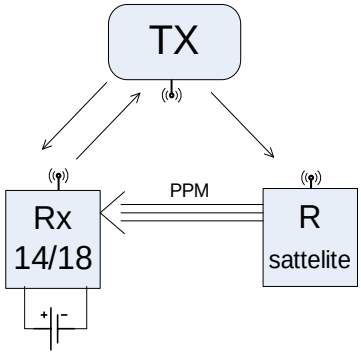
All outputs are affiliated with the input channel CH1 of the transmitter. Setups of reverse, gain, FailSafe, delay, curves and ATV Limits check with all channels. The output channels are as well set up for the same group of servo pulse generation. The servos will be temporally synchronized and accordingly movements of all servos will be synchronized.
Before mechanical coupling of individual servos (it is advantageous to use servos of the same type) we recommend to bring them all with the aid of function „Output Trim“ to the same neutral position in order to prevent reciprocal loads of the servos. The setup of equal endpoint throws can be achieved by gain changes of the individual channels with the aid of „Gain A/B“.

2)
Setup of different behaviour patterns of receiver outputs in case of transmitter signal loss. The throttle is affiliated with the receiver output channel Y3 and the other servos are connected to the remaining receiver outputs. In case of a signal loss we claim all servos to stop in their last positions and the motor must be switched off.

Out Pin Set													
Set Output Pin	**SetInChannel**	**Reverse A**	**Reverse B**	**Gain A**	**Gain B**	**Signal Fault**	**FailSafe**	**Delay**	**Curve**	**ATV HighLimit**	**ATV LowLimit**	**Output Trim**	**Output Group**
Y1, Y2, Y4,...	CH1, CH2,CH4,..	off	off	100%	100%	**Repeat**	-	0s	linear	2,0ms	1,0ms	0,0ms	A,B,…
Y3	CH3	off	off	100%	100%	**Fail Safe**	**1,2ms**	0s	linear	2,0ms	1,0ms	0,0ms	C

Wiring Example of the receiver R18: Connection of receiver RSat to the input SAT1 of the receiver R18

The receiver RSat gets its current supply from receiver R18 and is paired with the transmitter module Tx. We recommend not to exceed a connection cable length of 2 meters between the receivers R18 and RSat.

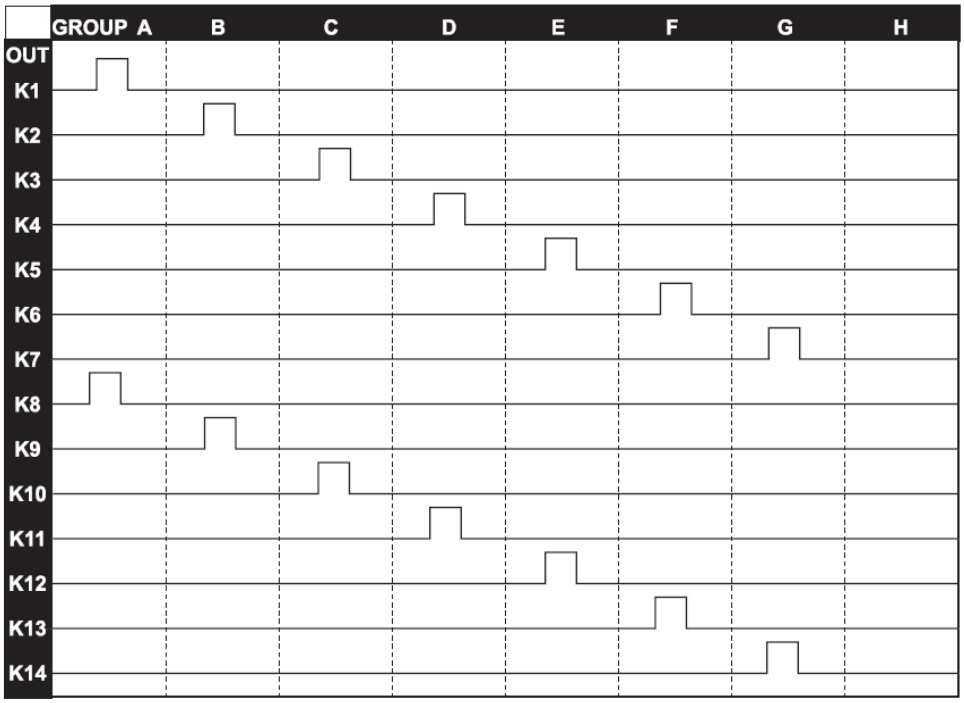


Setup of receiver RSat:
Menu *Main Setting*:
- *Rx mode: Clone* – setup of the satellite receiver to monitoring mode
- *PPM Output mode: Direct* – setup of the satellite receiver to the mode of direct PPM signal generation, i. e. without changes in the receiver. With this setup the PPM signal is generated in the same configuration as it was loaded by the encoder into the transmitter module. Any claims for signal changes in the receiver are set up in the main receiver R18.
- *Signal Fault: Out Off* –if the satellite receiver will not receive any signals from the transmitter, there will be no PPM output signal generated at the RSat output and the transmitter module will report this situation by an acoustical signal (if the alarm for PPM signal loss in the R18 receiver is activated)

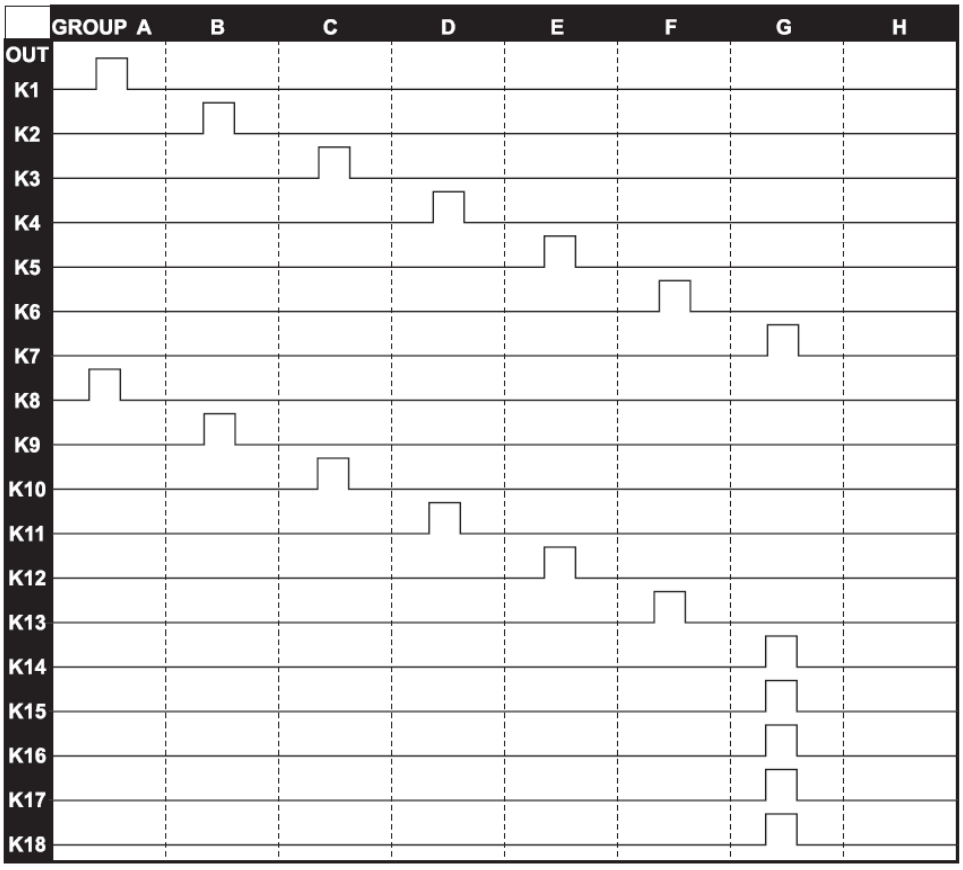
Setup of the receiver R18:
Menu *Out Pin Set – SetInChannel Y18* – select item *PPM input*, in that case you will be furtheron able to set up the alarm for PPM signal loss at the input of SAT1 – *PPM Alarm Code A*.

DUPLEX Rx

Default setup of the R14 receiver Output Groups (Production Setup)



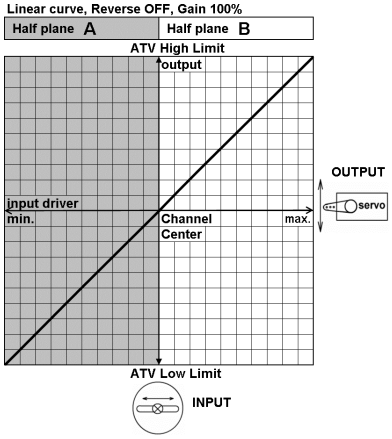
Default setup of the R18 receiver Output Groups (Production Setup)



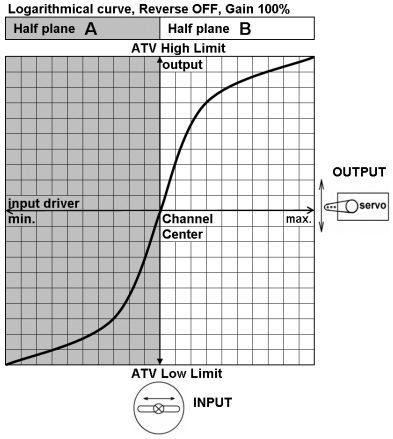
DUPLEX Rx

Examples of dependence of output channels from input and receiver setup

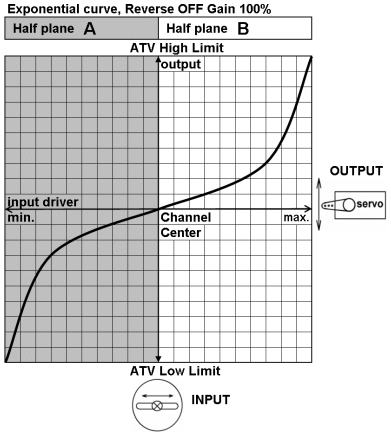
Linear curve, Reverse OFF, Gain 100%



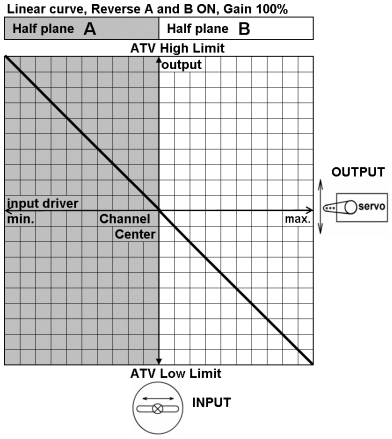
Logarithmical curve, Reverse OFF, Gain 100%



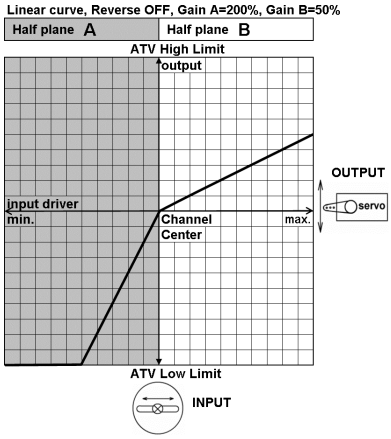
Exponential curve, Reverse OFF Gain 100%



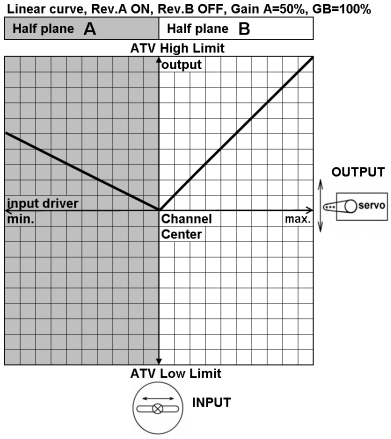
Linear curve, Reverse A and B ON, Gain 100%



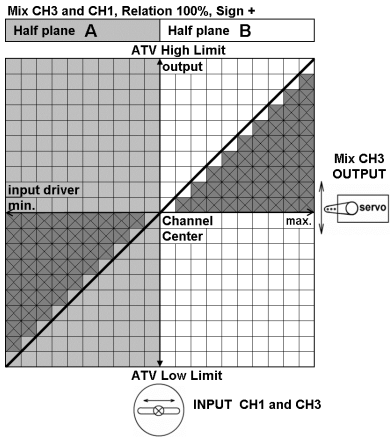
Linear curve, Reverse OFF, Gain A=200%, Gain B=50%



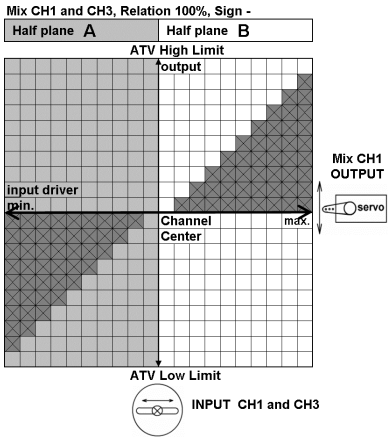
Linear curve, Rev.A ON, Rev.B OFF, Gain A=50%, GB=100%



Mix CH3 and CH1, Relation 100%, Sign +

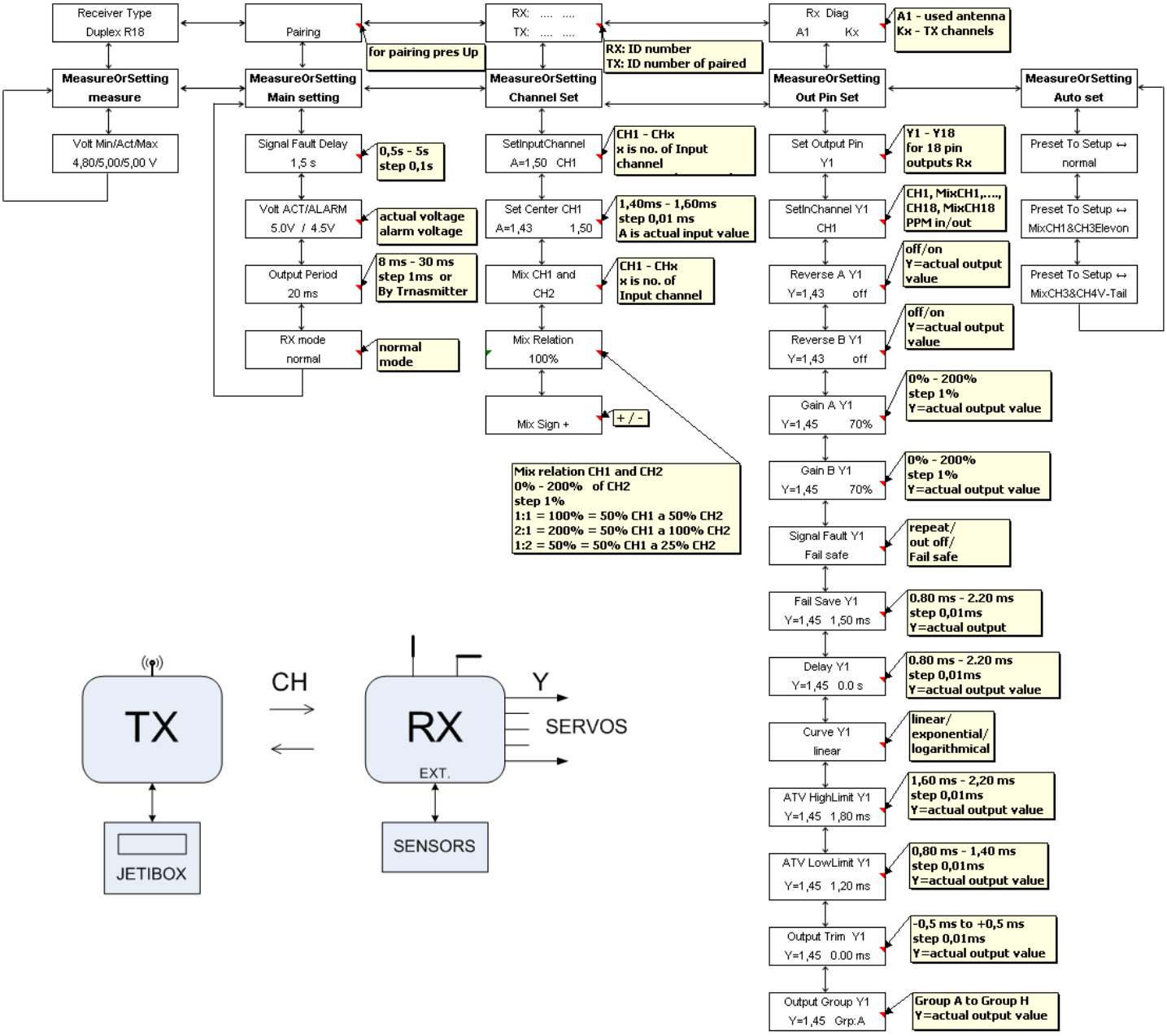


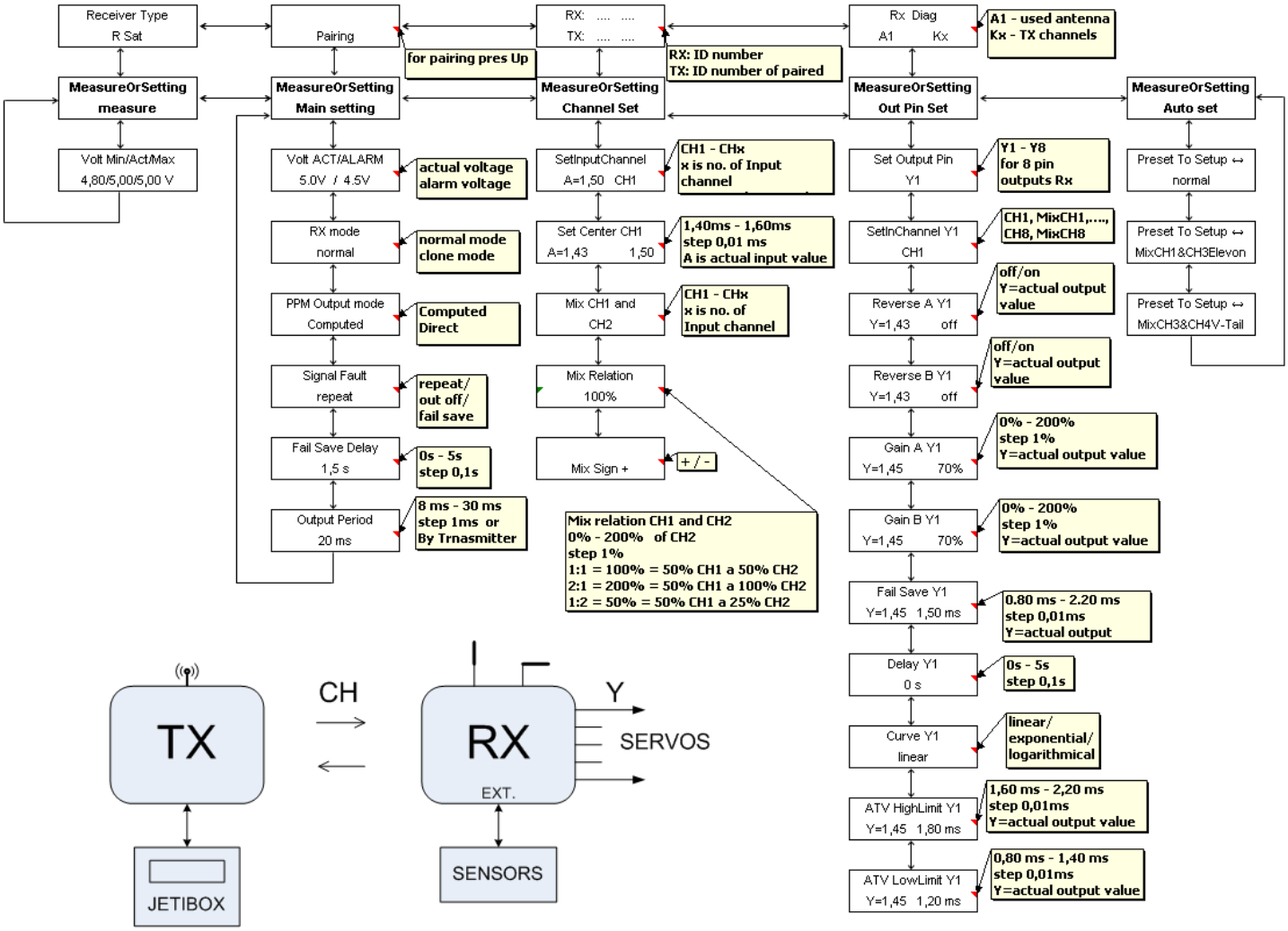
Mix CH1 and CH3, Relation 100%, Sign -



DUPLEX Rx

On the JETIBOX LCD Display shown Menus of R14 and R18 Receivers:



DUPLEX Rx

On the JETIBOX LCD Display shown Menu of the Satellite Receiver: