DSL- Receiver System

Description:

The DSL receivers are a completely new receiver system for model radio control systems, offering unprecedented facilities and transmission security. The receiver also incorporates servo functions which have never been implemented before.

DSL-Receeivers are DDS-10, DSL-8DSQ, DSL-6

- The DSL receivers utilises **PCS technology** (Pulse Controlling System), a new process designed to prevent unwanted servo deflections in PPM operation. The system smoothes out any deflections, but allows slight servo unrest or delayed servo response to occur, thereby enabling the pilot to realise that there may be a problem. There is no hysteresis at the switch-off point. Programmable servo positions can be set if interference should occur (fail-safe).
- Two DSL receivers can be coupled via the **DSL port** (data interface) to form a **Diversity receiver unit**. This arrangement completely suppresses reception problems such as directional effects and signal blanking, providing a significant improvement in effective range and safety margins. The coupled receivers also provide twice the number of freely programmable servo outputs.
- The DSL-System opens up **completely new possibilities for Trainer operations,** requiring no special modules or add-ons in the two transmitters.
- The revolutionary **SPS system** (Servo Programming System) allows all servos to be assigned to any output with complete freedom, even when a Diversity system is in use. All servo travels and directions are variable, and three additional mixer functions are available for each servo output. The mixers are variable, and can be triggered (switch function) by all servo channels, battery voltage, field strength values or fixed values. These integral features make complex transmitters superfluous, and provide adjustment facilities which are not possible even with the most expensive transmitter. These features relieve the transmitter software of nearly all of its work.
- The receiver features an **internal data memory** which permits the user to record and display in graphic form any variations in field strength and battery voltage. This means that you can analyse the changes in battery voltage during the last 20 minutes of a flight, and optimise the installation of the receiver aerial to eliminate problems shown up by the recorded data.

These fundamentally new technological features for radio control operation open up a broad new field for optimising reception, and **making the transmission path more secure**. If used with the T3S system, the DSL-receivers can even be used for signal transmission and reception on two different frequencies. High-performance RISC processors allow all settings to be adjusted and programmed in the receiver, whereas previously they had to be set up using complex transmitter software. Adjustments and functions are now available which are simply not possible at the transmitter.

Why have we invested such effort in developing this system?
Model aircraft are steadily growing larger, more expensive and more complex, and they are being fitted with far more servos and other auxiliary electronics, all of which require a large number of cables.
All these complications affect normal reception, since every extra cable modifies the "Radio Frequency receiving system", and adversely affects its efficiency. The results of these "interference sources" are not predictable, but one common problem is directional effects which result in blanking of the signal even at short range, often with fatal results.
Until now only one transmission frequency has been used to transfer the signal from transmitter to model, and the (permitted) transmitter power to carry this signal is extremely low. This means that the signal does not always arrive safely at the model, and this problem is exacerbated by the directional effects mentioned above.

These problems are eliminated by the DSL receiver system through Diversity reception.

We do not necessarily share the opinion that the permitted technology incorporated in today's standard commercial transmitters is suitable for these large-scale and jet-powered models; models which are becoming more and more popular, and for which there appear to be no limits.

However, these models do exist, and to cope with their demands we certainly believe that everything technically possible should be done to render the transmission path secure. That's why we have developed the DSL system.

Description of functions, explanation of terms

PCS System
The DSL receiverers are utilising **PCS technology** (Pulse Controlling System), a new process designed to prevent unwanted servo deflections in PPM operation. The system smoothes out any deflections, but allows slight servo unrest or delayed servo response to occur, thereby enabling the pilot to realise that there may be a problem. There is no hysteresis at the switch-off point if interference is detected; the point where it was switched off is the point it is switched on again (major difference compared to PCM systems). Programmable servo positions can be set if interference should occur (fail-safe).

Diversity reception / DSL (Diversity Synchro Link)
Why Diversity technology? Diversity technology maintains the radio link even when frequency-specific interference, spatial interference or interruption occurs, because there are two spatially separated aerials used for reception (aerial diversity). Additional security from interference on one frequency can be obtained through frequency diversity; this means that two transmitters are used, radiating a signal on different frequencies. In the Full Diversity receivers designed for this, the two aerial signals are amplified, filtered and demodulated separately. The two demodulated signals are assessed (multiplied) by their individual signal field strength, and the result is added together. This process generates a fluid transition from one channel to the other, and at the same time considerably increases the signal : noise ratio of the wanted signal. In an extreme case, where both aerial signals suffer from serious noise, a usable signal can still be gained. **A Diversity receiving system therefore always provides optimum reception under the most difficult conditions**. For all these reasons Diversity not only provides a significant increase in range, but is also much more secure at close range (quote from a final degree dissertation in a research institute).

The DSL system can provide Diversity reception if two DSL receivers are coupled together via the DSL data interface. In this arrangement they automatically exchange information about the current reception situation and servo positions. If one receiver encounters momentary interference, or if one aerial is in an unfavourable position, and its signal momentarily fails, the second receiver's data is used to send correct signals to all the servos. In such a system both receivers have equal rights and receive on the same frequency, but - ideally - are connected to **differently positioned aerials** and separate power supplies.

Trainer operations
The combination of DSL System technology creates **completely new possibilities for Trainer mode operations**, without requiring any special modules or add-ons in the two transmitters.

The whole system can also be carried out using two receivers in the model, connected via DSL (Real Mode). In this case the frequency is not switched. This arrangement provides for Trainer mode operations, but is also suitable, for example, for a complex model which is to be controlled by two pilots. In this case it is possible to select which pilot controls which functions. If one transmitter should fail, control of all functions is transferred automatically to the second transmitter (auto switch-over).

SPS Function
The integral **SPS system** (Servo Programming System) allows all servos to be assigned to any output with complete freedom, even when a Diversity system is in use. All servo travels and directions are variable, and three additional mixer functions are available for each servo output. The mixers are variable, and can be triggered (switch function) by all servo channels, battery voltage, field strength values or fixed values. These integral features make complex transmitters superfluous, and provide adjustment facilities which are not possible even with the most expensive transmitter. These features relieve the transmitter software of nearly all of its work. The settings can also be stored in a Palm hand-held computer and transferred back into the receiver (model memory function).

Data memory
The receiver features an **internal data memory** which permits the user to record and display in graphic form any variations in field strength and battery voltage. This means that you can analyse the changes in battery voltage during the last 20 minutes of a flight, and optimise the installation of the receiver aerial to eliminate problems shown up by the recorded data. The internal data memory can also be used to record other values, e.g. data from external sensors. The data can be stored in a Palm hand-held computer for subsequent display.

Programming
All functions apart from SPS, Scanner and Data Memory can be called up **without an additional programming unit (Palm)**.

Programming the SPS and data memory functions requires a standard commercial Palm hand-held computer, which must have the Palm OS 3.5 operating system or higher (current cost about € 90.00). A cordless connection is used via the Infra-Red interface (Irda). Alternatively the receiver can be programmed using a PC with a direct connection via the serial interface.

Functions of the DSL system

1. Integral DSL data interface
2. True Diversity reception (with two coupled DSL receivers, automatic, no programming)
3. Channel expansion / cascading of servo outputs: twice the number of directly available servo outputs using the "DSL" port.
4. Trainer system with TWO receivers (true diversity)
5. New smooth PCS fail-safe function, no unwanted servo deflections
6. 12 free mixers each with 3 programmable input criteria and switched states; programmable direction of rotation, servo travel, centre setting, fail-safe and many other unprecedented functions for all servos *
7. Freely programmable channel assignment for all servo outputs *
8. Programmable extended servo travel for optional increased servo power *
9. Trainer mode programmable at the receiver; no additional Trainer module required in the transmitter. *
10. Internal memory for recording and reading out voltage, interference analysis and additional functions. *
11. Graphic display of recorded data using Palm. *
12. Software can be updated for subsequent developments. *

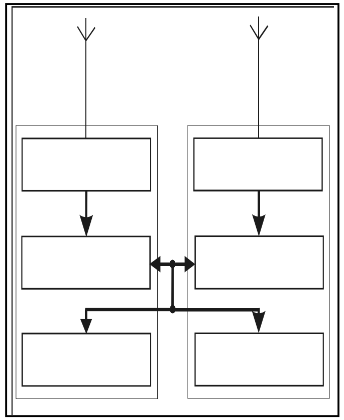
** Palm hand-held computer required*

2. Operating the DSL system

Diversity reception / DSL (Diversity Synchro Link)
Why Diversity technology? Diversity technology maintains the radio link even when frequency-specific interference, spatial interference or interruption occurs, because there are two spatially separated aerials used for reception (aerial diversity). Additional security from interference on one frequency can be obtained through frequency diversity; this means that two transmitters are used, radiating a signal on different frequencies. In the Full Diversity receivers designed for this, the two aerial signals are amplified, filtered and demodulated separately. The two demodulated signals are assessed (multiplied) by their individual signal field strength, and the result is added together. This process generates a fluid transition from one channel to the other, and at the same time considerably increases the signal : noise ratio of the wanted signal. In an extreme case, where both aerial signals suffer from serious noise, a usable signal can still be gained. **A Diversity receiving system therefore always provides optimum reception under the most difficult conditions**. For all these reasons Diversity not only provides a significant increase in range, but is also much more secure at close range (quote from a final degree dissertation in a research institute).

The principle of Diversity operation
The next section explains how Diversity reception works, to help you understand more easily what is happening in Diversity mode, and where the advantages of this mode of operation lie.

As with any receiver, the signals from the transmitter reach the RF section of the receiver or receivers via the aerial(s). In the receivers - as with any other receiver - the RF signals are analysed completely and demodulated. The result is two LF signals of optimum quality.



These signals are passed to the Diversity processors fitted to both receivers. The processors communicate with each other and decide which of the two signals is better; the better signal **is then passed to the servo output of both receivers.**

This means that the signal from the "better receiver" is always shared and passed on to each individual servo output of both receivers.

A side-effect is that channels 1 - 10 are duplicated and available directly from both receivers; the signal which is duplicated is always the better or cleaner one.
If two receivers are used with spatially separated aerials, that is termed Aerial Diversity. If two frequencies are used, that is known as Frequency Diversity.

The DSL system can provide Diversity reception if two DSL receivers are coupled together via the DSL data interface. In this arrangement they automatically exchange information about the current reception situation and servo positions. If one receiver encounters momentary interference, or if one aerial is in an unfavourable position, and its signal momentarily fails, the second receiver's data is used to send correct signals to all the servos. In such a system both receivers have equal rights and receive on the same frequency, but - ideally - are connected to **differently positioned aerials** and separate power supplies.

Range checking with Diversity systems
Standard range checks may show up no particular differences. The advantages only become apparent if you take the trouble to produce virtually a "map" of effective range, walking round the periphery of maximum ground-range all round the model. At those positions and directions in which a single receiver system exhibits obvious problems, the Diversity system with two receivers will always be significantly better.

Diversity mode

To couple two DSL receivers to form a Diversity receiving unit, the two units have to be connected using the DSL cable. The two receivers then communicate with each other automatically, and the signal from the receiver with the better reception is fed to the servo outputs of both receivers, i.e. the system only makes use of the better aerial signal (see below).

Installing and using a diversity system in the model
The two receivers can be installed directly adjacent to each other; the maximum spacing is determined by the length of the DSL cable: 25 cm. A 50 cm long DSL lead is also available as an optional accessory.

The two aerials should always be deployed as far as possible from each other. Ideally the two aerials should not face in the same direction; they should be arranged at 90° to each other, e.g. one aerial in the fuselage running towards the tail, the other along the leading or trailing edge of the wing.

We also recommend the use of whip aerials. For example, in a large-scale model one whip aerial could be fitted at the nose of the fuselage, the other whip aerial towards the tail end.

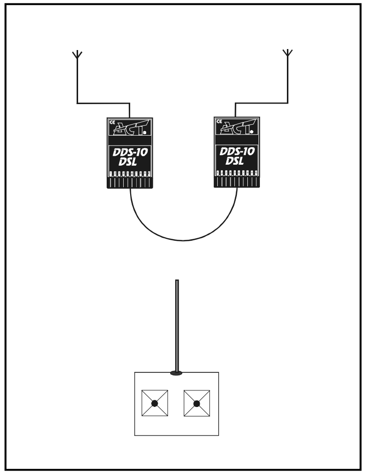
In many large gliders the only option is to deploy both aerials in the fuselage, running towards the tail. However, in this case it is important to install one aerial on each side of the fuselage, and keep them as far apart as possible.

In general terms, the more "aerial area" both receivers "show" to the transmitter in every possible position of the model, the better the reception, and the better the diversity effect. It should not be possible to place the model in any position relative to the transmitter in which both aerials can only be "seen" as a point (end-on).

Coupling two DSL receivers automatically doubles the number of servo outputs. At all the servo outputs of both receivers the signal present is always the signal from the receiver with the better reception of the two. The processors in the receivers communicate constantly with each other, decide which of the two signals is better, and then **pass that signal to the servo output sockets of both receivers**. This means that channels 1 – 6, 8 or 10 are always duplicated and directly accessible, and the signal is always that picked up most strongly or most cleanly by one or other receiver.

Diversity mode, options

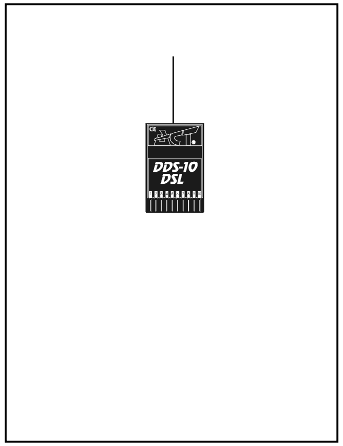
1) 2**x DSL receiver in the model, 1 transmitter**
The model is fitted with two receivers coupled via their DSL ports, so two receiver aerials are deployed in the model (aerial diversity). The two receiver aerials are mounted separately and apart in the model.



Both receivers operate on the same frequency channel, i.e. the frequency used by the transmitter. They are inter-connected via the Synchro-Link cable.

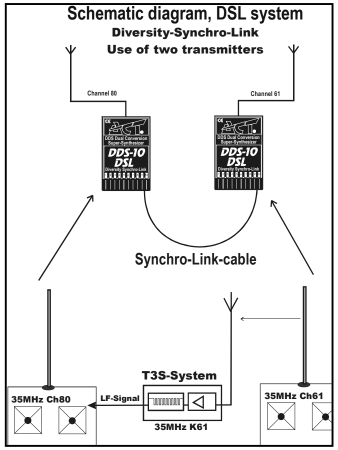
Since the two aerials are deployed in different directions, one of the two aerials will always have a better position relative to the transmitter than the other one. The two receivers communicate intelligently, with the result that only the better of the two received signals is passed to the servo outputs. This arrangement eliminates directional effects almost entirely. All servo outputs of both receivers are available, since two receivers are used.

2.) Two transmitters, synchronised using the T3S system, one DDS-10 receiver
(only with DDS-10)
With this arrangement the DDS-10 Synthesizer constantly scans two programmable frequencies whilst it operates as a receiver. DDS technology means that this occurs without the pilot being conscious of the switching between channels. At all times only the best of the two transmitter signals is used. Directional effects are greatly reduced because the radiated energy on each frequency channel emanates from a different direction (transmitter 1 or transmitter 2), and one of the two signals will always be better than the other.



This system uses two frequency channels to transmit data to the model, thereby doubling the security of the radio link; the two transmitters should be spatially separated to some extent. The two transmitters are synchronised with each other by means of the T3S system. The transmitters radiate the same control signals (synchronously), from a single pilot, on different frequency channels; the back-up transmitter must feature a Trainer function (aerial and frequency diversity).

3.) Frequency and aerial diversity, two transmitters on two frequencies with 2 DSL receivers
Transmission security can be further increased if two receivers are used operating on different frequencies, controlled by separate transmitters. The transmitters can be coupled and synchronised using our T3S system in Trainer mode, to avoid having to operate two transmitters simultaneously.



In practice any second transmitter with a Trainer facility can be used simply as the back-up (reserve) transmitter, radiating on a different channel to the primary transmitter. This back-up transmitter is equipped with the T3S system. The T3S system on the primary transmitter is scanned in, and set up close to the pilot, e.g. on a tripod. In fact, only the RF module of the back-up transmitter is used, so the stick mode, mixed functions etc. of this second transmitter do not have to be taken into account, the use of two identical transmitters offers an additional advantage: if the primary transmitter fails, the pilot can continue to control the model using the back-up transmitter. The primary transmitter (which the pilot uses to control the model) does not require a Trainer facility.

The following items are required:

- Two transmitters (PPM modulation)
- One transmitter (back-up transmitter) with Trainer module (socket for Trainer mode as Teacher, with Trainer switch)
- One T3S system
- One T3S adaptor for the back-up transmitter

The model must have two DSL receivers installed in it, programmed to the frequency channels used by the two transmitters.

This system is capable of transmitting the control signals to the model on two frequency channels. The pilot operates one transmitter, the two transmitters are synchronised by means of the T3S system, and the correct control signals are transmitted to the model from the second transmitter on a different channel.

3. The programmable functions of the DSL System

All the functions of the DSL system can be programmed using the receiver's DSL synchro data port. This is carried out by connecting the DSL Infra-Red Interface, which provides the means of **communicating remotely with a Palm hand-held computer.** These are available from any electronics supplier (current price around € 80.00 for the basic model). The minimum requirement is a monochrome PALM hand-held running OS 3.5 or higher. The programming software for the Palm is supplied with the Infra-Red Interface.

The PALM program "**DDS-10.PRC**" supplied on the CD should be copied onto the PALM hand-held from your PC using the Synchroniser function (HotSync). When you have done this, the appropriate icon (DDS-10) should appear on the PALM's screen. Tapping on this icon with the stylus starts the program. Both receivers and the transmitter must be switched on before you can start programming, and the Infra-Red Interface of the Palm computer must be directed towards the DDS-10 Infra-Red Interface.

The programming procedure can also be carried out **from the PC** using a direct connection via a vacant serial port. For this you require the serial "Interface T3S PC Scanner" and POSE software. With this arrangement you can program the functions of the DSL system directly on the PC's screen. Detailed instructions are supplied with these products.

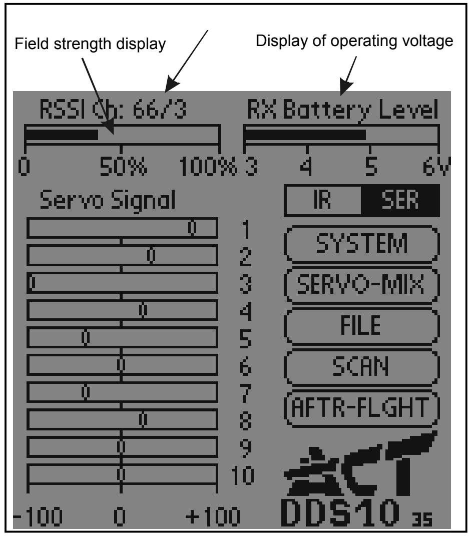
Serial Interface	**Infra-Red Interface**
The following items are required:	The following items are required:
1. Serial Interface, Order No. 524050	1. Infra-Red Interface, Order No. 524046
2. POSE software (included)	2. DDS-10 software (included)
3. DDS-10 software (included)	3. Palm running OS 3.5 operating system
4. DSL / serial adaptor lead	or higher, or 5.0 and Infra-Red Interface
5. PC / Laptop, Windows 98 or later	

Getting started

If a receiver is not connected, or if the receiver has no power or is defective, the screen just displays three dashes "- - -" instead of the reception channel display. The field strength and battery display remain blank:

If a DSL receiver is connected and working, the screen displays the reception field strength, the receiver battery voltage and the position (servo signal) of all servo channels.

-100% means a pulse width of 1.0 msec, 0% means 1.5 msec, and +100% means 2.0 msec.

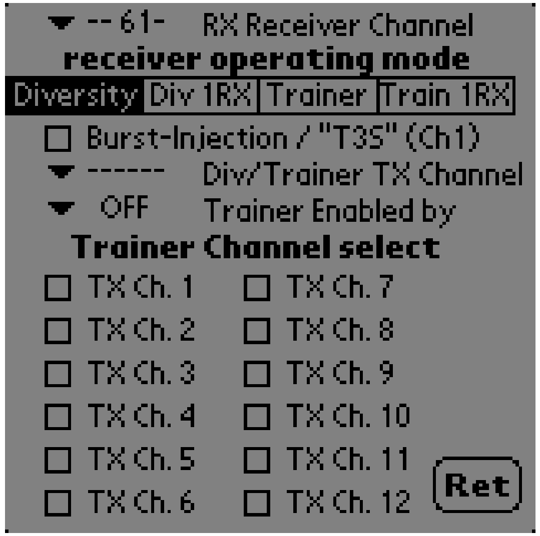


The buttons SER (serial) and IR (Infra-Red) are available for you to select the method of connection. If the receiver(s) is (are) connected via the Infra-Red Interface, you must also select the receiver connected in this way. You can do this by tapping on "IR", which switches between the receiver sockets on the Infra-Red module.

On the right-hand side of the operating area you will see five menu buttons which branch off to associated sub-menus. These are used to display the programming and all the functions of the receiver automatically; they are discussed in detail over the next few pages.

3.1 The SYSTEM menu

The system menu is opened by tapping on the SYSTEM button. The system data is loaded in from the receiver, and the following screen appears on the PALM hand-held computer:

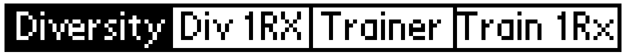


Explanation of functions

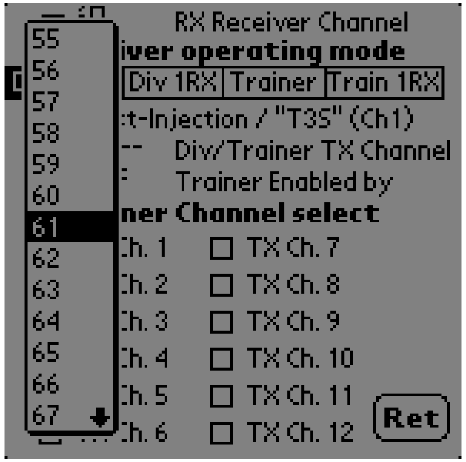
At this point you can check and alter various SYSTEM PARAMETERS. Depending on the parameter, this can be activated by **CHECK BOX**, by **RADIO BUTTON** or by **SELECTOR LIST**.

CHECK BOXES are the small empty squares. Tap on the square once to place a tick in the box and thereby activate the parameter. Tap again to erase it and disable the parameter.

RADIO BUTTONS are selector buttons. It is only possible to select **one** from a series of these, and this action automatically disables the others. The activated button is displayed in inverse video.



SELECTOR LISTs are indicated by a small, downward-pointing triangle. Tapping on the triangle produces a list from which you can select a value. This value then appears in the headline of the SELECTOR LIST.



For example, if you wish to select reception channel 61 (only DDS-10), tap briefly on the "RX Receiver Channel" SELECTOR LIST. A pull-down menu is displayed:

If the desired channel is in the list, you can select it directly by tapping on it with the stylus. If the desired channel is visible in the list, leaf through by tapping the **Continue Arrow** until the desired channel is displayed, then select it in the usual way.

Once this is done, the selected channel is displayed in the headline of the System Display.

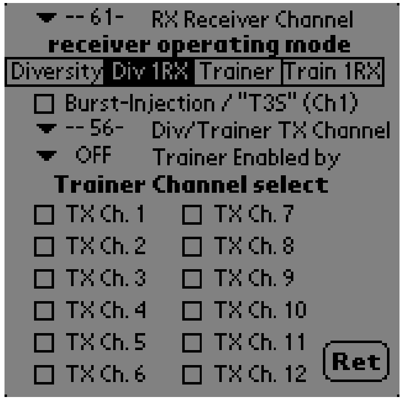
Functions of the SYSTEM menu:

Rx Receiver channel: this is where you determine the reception channel on which (only) the DDS-10 receiver is to work. When you select a channel, the information is sent to the receiver directly (serial link) or by Infra-Red; the receiver then switches to this channel and stores it as the new default (standard) channel. If a separate beeper is connected to the AUX output, any change to the EEPROM memory is confirmed by a brief beep.

Receiver operating mode: at this point you can select the receiver function.

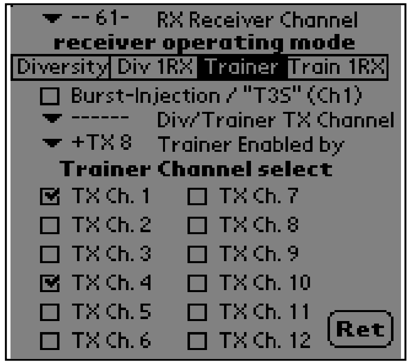
Diversity: standard operating mode, with the option of coupling two receivers for use with one transmitter (Diversity; see above). **This mode of operation must be set for normal operation, and for Diversity operation with two DSL receivers.**

Diversity 1RX (only DDS-10) **(Div1RX):** as Diversity-Std., but with ONE receiver and two transmitters operating on two frequencies. The receiver switches over to the alternative frequency if the reception conditions make this necessary, or if a significantly stronger signal is available on the alternative frequency. **The alternative frequency is set in the "Div/Trainer RX Channel" Selector List**. Switching to the alternative frequency and back is virtually imperceptible.



Trainer: two independent transmitters, working on different frequencies, are received by two DSL receivers, coupled by a Synchro-Link cable. With this arrangement the received data can be assigned channel by channel to the Teacher transmitter or the Pupil transmitter. The global Trainer transfer is carried out using a vacant channel at the TEACHER TRANSMITTER; this can be selected in the **"Trainer Enabled by"** Selector List. The receiver functions to be transferred should then be defined using the check boxes "RX Ch. 1" to "RX Ch. 12". The global Trainer transfer channel MUST be left on the Teacher transmitter!

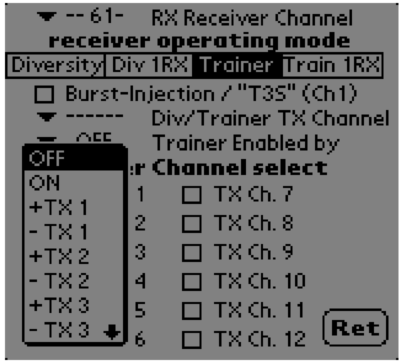
TRAINER 1RX (only DDS-10) **(train 1RX):** as TRAINER, except that only ONE receiver is required; the reception frequency is constantly switched over. The reception frequency of the Pupil transmitter is defined in the **"Div/Trainer Rx Channel"** Selector List. All other Trainer functions as for TRAINER (2RX).



The servos will move a small bit slower as normal, but with normal power and always with enough speed to control the trainer model. In this mode, the RSSI levell will not be displayed in the start display.

Div/Trainer TX Channel (Selector List):
This is where you select the alternative frequency in Diversity 1-RX and Trainer 1-RX modes. In the 2-RX modes (Diversity / Trainer) this list is not available, but the receiver retains the value once you have set it.

By this means you program the DSL receivers to the essential second transmission channel for this Diversity or Trainer mode of operation. At the same time you determine which frequency channel is assigned to the master channel, i.e. the Teacher transmitter (the channel selected in normal Channel Select), and which is assigned to the back-up transmitter or Pupil transmitter (the one in Div/TrainerRX).



Trainer Enabled by (Selector List):
At this point you select the global Trainer transfer switch at the Teacher transmitter (physical switch or other control on the Teacher transmitter). You can select any function channel for this, and you can also choose any position of the selected transmitter switch or control as the positive or negative setting. The switching point is a setting which exceeds the neutral point of the control channel either in the positive or negative position. "Positive position" means that the pulse width of the function channel (control or switch) is less than 1.55 msec; "negative position" means that the pulse width of the function channel (control or switch) is greater than 1.45 msec.

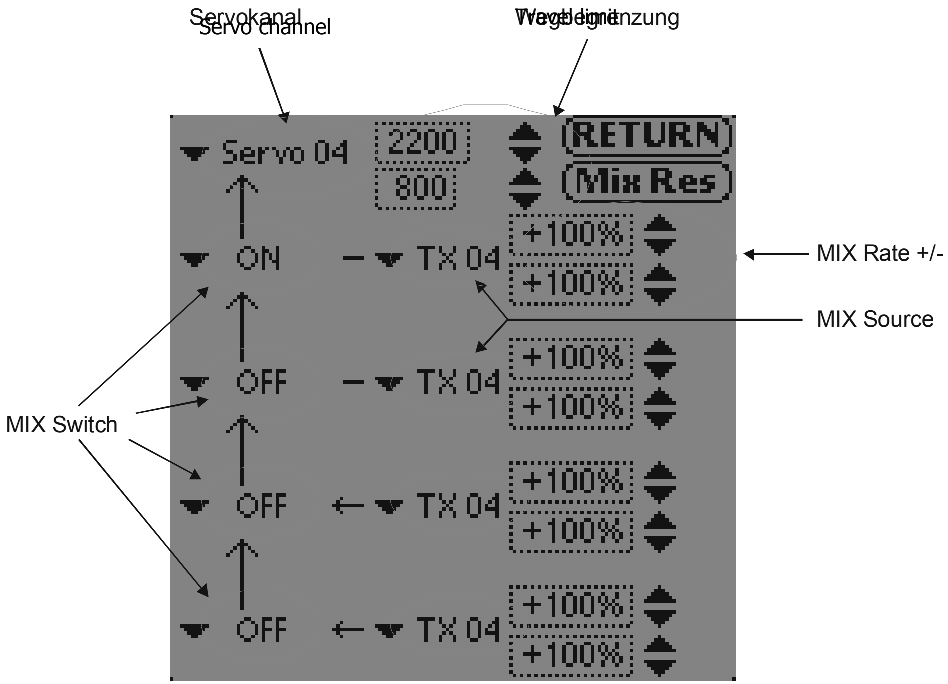
Trainer Channel Select:
Here you select which of the function channels are to be transferred to the Pupil transmitter in Trainer mode, i.e. you define which individual control surface functions the Pupil is allowed to operate when control is transferred to his transmitter.

Typical Trainer mode settings:
When channel 8 (transfer switch) on the Teacher transmitter is in the positive position, the Teacher transmitter on channel Ch78 takes over reception channels 1 and 4 from the second receiver connected by Synchro-Link (receiving on the Pupil frequency). If this is not the case, the Teacher transmitter maintains control of all receiver channels.

The Pupil can therefore control channels 1 and 4 on the model when the Teacher operates the transfer switch (channel 8) on the Teacher transmitter (positive position) in Trainer mode.

The same procedure also applies when only one receiver is used in the model.

3.2 The SERVO-MIX menu:



Every Servo-MIX display always refers to the servo (or corresponding receiver output) indicated for that servo channel (see diagram). Four mixers and two end-points can be programmed for all 10 servos which can be connected to the receiver. Each additional mixer function is added to the first mixer function.

Servo channels:
All servo outputs are programmed in sequence. The corresponding servo output is selected in the "SERVO CHANNEL" Selector List.

Travel limit:
Each servo output features two end-points which can be adjusted in the "TRAVEL LIMIT" field. This function works as a genuine "servo limiter". The displayed values refer to the width of the servo pulse in *sec.

Changes are made by tapping on the UP / DOWN arrows. **The minimum travel between the two end-points is 140 *sec (approx. 15%); it is not possible to reduce the value below this point!** If no change is made for a period of four seconds, the new value is sent to the receiver where it is stored and activated.

MIX switches
The four mixers which are available can be switched on or off selectively. The following options are available as switch functions:

OFF/ON	*+TX 1/-TX 1*	*+TX 2/-TX 2*	*+TX 3/-TX 3*	*+TX 4/-TX 4*
+TX 5/-TX 5	*+TX 6/-TX 6*	*+TX 7/-TX 7*	*+TX 8/-TX 8*	*+TX 9/-TX 9*
+TX 10/-TX 10	*+TX 11/-TX 11*	*+TX 12/-TX 12*	*+Batt/-Batt*	*SignlOK/SignlLost*

In addition to the self-explanatory (constant) conditions 'ON' and 'OFF', all the transmitter's function channels can be used as mixer activation functions in the positive position (> 1.5 msec pulse width) and negative position (< 1.5 msec pulse width). Mixer activation can also be coupled to the battery status (+Batt / -Batt) and receiver status (SignlOK / Signllost) (e.g. to create a fail-safe function). During diversity use a Fail Safe position only will be given to the sevos if even of diversity use, both receivers don't have a signal from transmitter.

MIX source: mixer signal source
This is where you select the mixer source. The following sources are available:

TX 1	*TX 2*	*TX 3*	*TX 4*	*TX 5*	*TX 6*	*TX 7*	*TX 8*	*TX 9*	*TX 10*	*TX 11*	*TX 12*	*FIX*	*RSSI*	*BATT*

'TRX1' … 'TX12' refers to the corresponding transmitter input channels. Any servo output can be assigned or duplicated in any way by assigning the mixer source.

'FIX' means that the mixer source is a fixed value for the servo position (e.g. for fail-safe or neutral point offset).

'RSSI' is the field strength indicator (Radio Signal Strength Indicator).

'BATT' is the voltage of the receiver battery.

MIX rate +/-: servo travel adjustment
At this point you can enter the positive and negative mixer rate values. This function provides symmetrical adjustment (both ends) of servo travel, enabling you to set the exact servo travel you require. Tap the arrow buttons with the stylus to reduce or increase the numeric values.

Servo Reverse
You can reverse the direction of rotation of the servos (Servo Reverse) by setting negative values for the mixer rate. Tap on the value to reverse the servo direction (reverses the prefix).

If you select 'FIX' as the mixer source, the fixed value should be entered in the Up-Rate field; the DownRate field is set to inactive.

SERVO SIGNAL:
The servo signal is calculated as the sum of all four mixer functions.

Example:
The first mixer must always be active (mixer switch ON) if you wish to control the servo indicated at the servo channel and connected to the corresponding receiver output. If you select the associated transmitter channel as mixer source, the servo will move appropriately.

Servo 01, travel limited to 2200 / 800, mixer switch ON, mixer source TX 1, all values 100%. This means that a servo connected to receiver output 1 moves over its full travel when transmitter control 1 is operated.

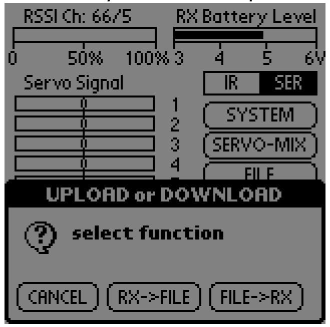
This does require a little careful thinking compared to typical transmitter programming; the logical sequence for setting up the mixer you require is as follows:

1. From which transmitter function channel would I like to control
2. which servo output at the receiver, and
3. turn it on using which switch.

3.3 Storing the SPS settings in the receiver

The basic rule is that all the SPS programming settings which you carry out in the Palm hand-held computer are transferred to the receiver and stored **there**. However, if you wish to back-up the settings for later experiments, or alternatively when moving the receiver to another model, it is also possible to store the SPS settings in the Palm (as in a transmitter's model memory).

To do this you must call up the **FILE** menu at the Start screen.

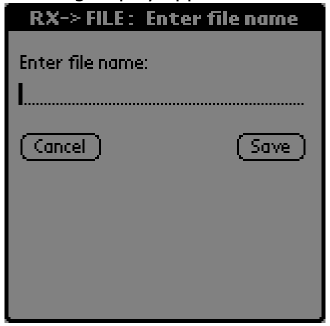


Here you can select whether
… you wish to store settings / data (file) in the Palm (UPLOAD)

(RX->file = store settings from receiver in the Palm.)

… or alternatively whether you wish to transfer settings which are stored in the Palm to the receiver (FILE -> RX = load data from the model memory in the Palm into the receiver DOWNLOAD).

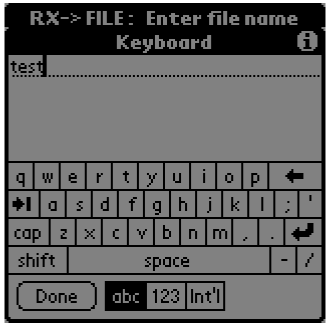
To store a back-up copy of receiver settings in the Palm (Upload) you must tap **RX -> FILE**; the following display appears:

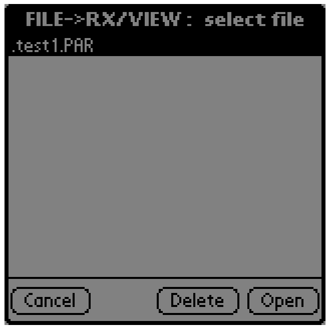


Now you can enter a name for these settings using the Palm keyboard.

The palm keyboard is opened by tapping on the **abcde symbol corners** in the rectangle **below the Palm display**.

Enter the desired name, confirm with **DONE**, and you will see the following display:





The suffix **PAR** (-ameter) is automatically attached to the name you have entered. This means that the FILE contains SPS programming data.

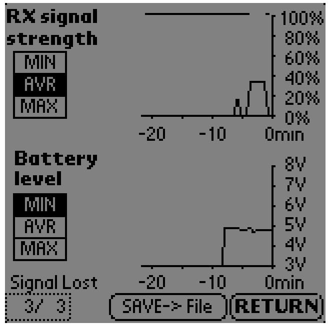
If you subsequently wish to transfer this data into the receiver and activate it, the same FILE (model memory) must be loaded into the receiver by Download (FILE -> RX).

This procedure enables you to transfer settings and data from the Palm to the receiver, and from the receiver to the Palm.

No settings are lost, and you can try out various settings for a particular model until you have found the optimum arrangement.

The number of possible "model memories" varies according to the storage capacity of the Palm you are using. The smallest Palm has 2 MB RAM, which equates to about 300 model memories.

3.3 The AFTER-FLIGHT Menu:



A very important function of the receiver is to record the reception conditions and battery status during the last 20 minutes of every flight. When the model is back on the ground, you can easily examine the receiving situation and battery voltage which occurred during the flight. The receiver stores a value for reception field strength every 20 seconds, and battery voltage every 60 seconds.

Receiver Signal Strength / Battery Level:
The example printed here clearly shows that the reception field strength fell briefly to '0', and never rose higher than 40% of the maximum possible signal during the flight.

Battery voltage does exhibit slight dips, but it always stayed in the safe range.

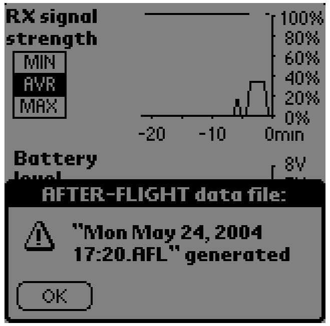
You can select the MIN / MAX / AVE radio buttons to display the field strength and battery voltage curves for maximum value, minimum value and average; the most important value is inevitably the minimum value, and this is the default setting when you call up the menu.

Signal Lost Events:
This shows the number of times the signal was lost during the flight. A signal loss occurs when reception field strength is reduced so severely that the receiver's inherent background noise overwhelmed the working signal, making it impossible to detect the correct signal, or when interference (electric motor, another transmitter) has allowed the receiver to lose track of the synchronous data flow.

If you study the information in the After Flight menu you can attempt to minimise the value by re-positioning the aerial and/or experimenting with interference suppression measures. A small number of Signal Lost events is relatively normal, but if you find more than 20 such events after a 5-minute flight at normal range, we strongly suggest that you look for the source of interference in the model, or try re-positioning the aerial.

Note:
The screen is refreshed every 10 seconds, at which time the image is erased briefly, then redrawn. The curve is drawn as if with a pen recorder, progressing slowly to the right along the time axis.

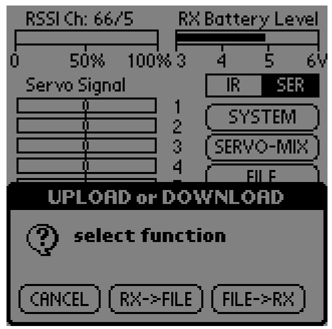
Storing the After Flight display in the Palm



These recordings can also be stored in the Palm hand-held computer and called up again later.

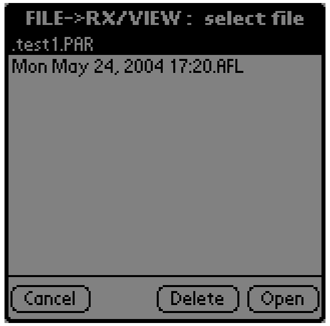
To do this you must tap on the **SAVE -> File** button; the following display now appears:

Press **OK** briefly to store the displays, together with the date and time of day.



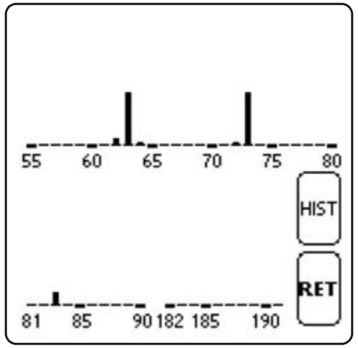
To call up these displays subsequently, tap the FILE button at the Start display. This screen now appears:

Tap **FILE ->RX**.



The FILE display now appears, showing all the stored data. The stored After Flight data files have an **AFL** suffix.

Tap **Open** briefly to transfer the graph to the After Flight menu, it will now be displayed on the screen.



3.4 The SCAN Menu

Although the DDS-10 receiver is designed primarily as a radio control receiver, it can also be used to monitor the frequency band. It does not make much sense to install the receiver in a model for this purpose, as the receiver generates NO servo signal during the SCAN process!

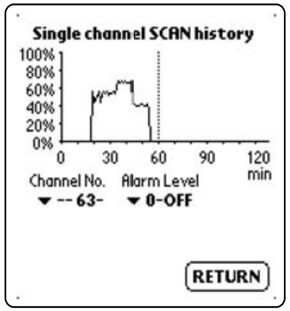
The standard method of using the receiver as a frequency scanner is to connect it to the PALM hand-held computer via the serial interface. The receiver must be connected to a power supply! The sequence of switching on the system is not important. If you are using the Infra-Red Interface, no additional cable connection is required.

When you select the SCAN menu button the screen display (above) appears on the Palm. It displays all the receivable channels and their momentary field strength. The size (height) of the vertical bar indicates the reception field strength on the individual channel.

The scanner can therefore be used to detect which channels are in use, to trace "rogue" flyers at the slope, and to show up interference.

As well as displaying all the channels currently in use, it is also possible to switch to the HISTORY display (see next page), where you can examine channel usage over the last two hours. Tap on the 'HIST' button to reach the History display.

Notes on usage: radio control transmitters do not radiate a signal exclusively on their nominal frequency; a small proportion of the transmitted energy "spills" onto the neighbouring channels. The field strength display therefore typically looks like a 'bell function', but this is normal, and does not indicate likely interference!



History display

The example shown here clearly shows that channel 63 was in use for about 40 minutes. The vertical dotted line marks the end of the scan range, or the duration of the scanning process to date; in this case 60 minutes.

The display is refreshed approximately every 10 seconds; this causes the graph to be re-drawn briefly. However, the scanning process continues running in the background for ALL channels.

The channel to be displayed is selected by means of the 'Channel No.' Selector List.

You can assign an individual ALARM LEVEL to each channel; when the time has elapsed, the Palm hand-held computer emits a warning sound to alert the user.

Notes on using the receiver / fulfilling the regulations

- This receiver is approved solely for use in radio-controlled models and as a monitoring receiver.
- If used in large models with many cables we recommend the use of separation filters incorporating ferrite rings. It is fundamentally essential to carry out a comprehensive range check, as long cables always modify the RF environment.
- Radio range on the ground should be at least 50 metres, and there should be no significant difference in range when the receiving system is outside the model, or installed inside it. There should be no significant range difference with motor stopped and motor running. At all times the receiving system should work without any errors or glitches.
- Pilots should always stand together when using radio control systems. A pilot who stands at a distance is likely to cause problems, as his transmitter will cause interference to another pilot's model flying close to him.
- **Always switch on the transmitter first,** and only then the receiver.
- The receiver aerial must be deployed full-length, **well away from electric motors and metal pushrods**. We recommend the use of whip aerials.
- Never carry out Scan mode (Channel Select) operations with the motor running.
- Take care to avoid electrical "noise" (caused by metal parts rubbing against each other). All electric motors must be suppressed.
- The receiver must be installed in the model at least 10 cm away from any electric motor, and at least 5 cm from any electronic speed controller and drive battery.
- For optimum operational security all radio control system receivers must be protected effectively from the effects of vibration. Ideally this takes the form of a thick layer of soft, anti-static foam rubber.
- Take care to use power supply cables of adequate conductor cross-section, and keep battery leads as short as possible. **Never use dry batteries**; use high-current NiCd batteries exclusively.
- If you are using a data transmitter in the model (vario etc.) keep the receiver at least 25 cm away from the vario transmitter's aerial. Carry out a range check before flying the model.
- Do not subject servo leads to strain; secure all cables with tape.