

## 1. SPECIFICATION

72MHz	
Part No.	<b># 20472x</b>
Reception system	FM / PPM dual conversion with IPD (Intelligent Pulse Decoding)
Dimensions L x W x H	2.2" X 0.9" X 0.95" or 56 x 22.5 x 24.5 mm
Weight	1.1oz. or 31 grams
Channel count	9
Sensitivity	approx. 2 µV
Current drain	approx. 20 mA (excl. servos)
Operating voltage	3.5 ... 7.5 V* ⇒ 4 – 5 NiCd / NiMH cells
Operating temperature range	5°F ... 130°F or -15°C ... 55°C

\* A low-voltage power-on guard prevents the receiver operating if switched on with a voltage below 4.5 V. Once operating, the receiver works without problem down to a voltage of 3.5 V.

## 2. SAFETY NOTES

! **Read the instructions before using the receiver for the first time**

! **Carry out regular range checks (→ 15.)**

! **Keep strictly to the following sequence when switching on and off:**

First switch the transmitter ON, then switch the receiver ON  
First switch the receiver OFF, then switch the transmitter OFF

! **Note regarding mixed operation**

This receiver can also be operated with transmitters not using Synthesizer technology, i.e. those using conventional plug-in crystals. This receiver is compatible with most other makes of RC equipment. Mixed operation with FM/PPM transmitters of other makes is possible in principle. However, we cannot guarantee that such a system will work perfectly, as there are too many possible combinations for us to check.

## 3. SPECIAL FEATURES

- PLL synthesizer receiver, requiring no plug-in crystals.
- Quick, simple change of RF channel using automatic channel search, with Lock-on security by confirmed channel acceptance from the transmitter.
- Dual shift (automatic shift switching) Use any FM transmitter.
- Use of standardised FM/PPM transmission format ensures compatibility with other makes of equipment
- IPD decoder (Intelligent Pulse Decoding) with HOLD and FAIL-SAFE functions

## 4. QUICK START (CHANNEL SETTING)

1. Switch the transmitter on.
2. Connect the receiver battery to the receiver, press and hold down the set button and switch on the receiver power. Release the set button after one second.  
⇒ LED flashes (RF channel search):



The RF channel search is concluded when the LED glows constantly:



3. Move any transmitter stick four times steadily to the same end-point.  
⇒ the LED must flash OFF / ON in time with the stick movement.



4. The RF channel setting procedure is concluded; the LED flashes:
5. Press the SET button. ⇒ The receiver is ready; the LED flashes:



## 5. RECEIVER CONNECTIONS

The **FUSION 9** receiver is fitted with universal UNI sockets which are compatible with the plugs used by most radio control manufacturers (Hitec, Futaba, JR, ...).

Socket	Function
<b>B</b>	Socket for receiver battery
<b>1 - 9</b>	Servo sockets, channels 1 ... 9

! **Check plug polarity carefully when connecting the receiver battery, servos, speed controllers etc. Check the pin configuration, especially with other brands of device.**  
**(see pin assignment symbol on the receiver )**

## 6. POWER SUPPLY

The **FUSION 9** receiver works over a broad voltage range of 3.5 – 7.5 V (⇒ 4 – 5 cell NiCd or NiMH receiver battery).

The receiver battery can be connected to the socket marked "B", or to any vacant servo socket 1 ... 9 (see also → 5.).

**!Check the maximum permissible operating voltage of all devices connected to the receiver (servos, etc.)!**

For example, some servos are only approved for use with 4 cells (4.8 V).

A battery in good condition and of adequate capacity for the purpose is indispensable for the safe operation of any model:

- Cables should be of adequate conductor cross-section. Keep all leads as short as possible, and avoid unnecessary connectors.
- If the system voltage falls below 3.5 V the receiving system may fail to work properly. Such voltage collapses may occur due to flat, poor-quality or defective receiver batteries, cable conductors of inadequate cross-section, poor-quality connectors, or from overloading or faults in the BEC system.

## 7. USING THE RECEIVER / LED INDICATORS

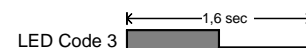
The **FUSION 9** receiver is fitted with one LED and one button (SET). These are used as follows:

- To set the RF channel
- To activate the FAIL-SAFE function and store the FAIL-SAFE positions
- To switch off the IPD filter (e.g. for range checks)
- To reset the receiver to the factory default settings (RESET)

The various operational states are indicated by the LED. The following section describes the receiver settings and corresponding LED CODES.

## 8. SWITCHING ON

If you have already set the receiver to an RF channel, the LED flashes after you switch it on:



(⇒ IPD filter active → 10. ). The receiver is ready for use.

If the receiver picks up an invalid signal, or no signal at all, when it is switched on, the LED glows constantly until a valid signal is received:



If you have not yet set an RF channel (new receiver, or after a RESET), the RF channel search commences automatically. The LED flashes during the RF channel search:



(⇒ Setting the RF channel → 9. )

**Note:**

The receiver checks the operating voltage: the value must be above 4.5 V immediately after it is switched on. If not, the receiver will not work until the voltage rises to a value above 4.8 V. If this should happen, the LED lights up briefly, then stays off until an operating voltage of more than 4.8 V is present:



## 9. SETTING THE RF CHANNEL

With the **FUSION 9** receiver the RF channel is set by means of an RF channel search, during which the receiver searches for the most powerful transmitter on the band. For this reason it is essential that your transmitter, set to the desired RF channel, should be in the immediate vicinity of the model (receiver) during the RF channel search. During the RF channel search keep the receiver a reasonable distance (> approx. 3 m) from other transmitters which are switched on.

**Sequence**

1. Switch on the transmitter, already set to the desired RF channel, Hold the receivers SET button pressed in, Switch the receiver on, Release the SET button.  
→ The RF channel search commences; the LED flashes:



**Note:**

The RF channel search generally takes about 2 - 4 seconds. If the process takes significantly longer, this indicates that no clear transmitter signal is present. Check that your transmitter is switched on, and that no other transmitter is in the immediate vicinity. Repeat Step 1.

2. The LED glows continuously when a transmitter is located:



3. Now move one transmitter stick four times steadily to the same end-point. The LED should go OFF in time with the stick movement. This is your means of checking that the receiver has locked onto the correct RF channel.

The process is complete when the LED flashes the confirmation signal:



4. The SET button must now be pressed and the receiver will now be operating on the set RF channel.

The receiver stores the set RF channel permanently until either you set a new RF channel, or RESET the receiver to the factory default settings (→ 13. ).

**Note:**

The signal output to the servo outputs remains switched off during the RF channel search process, i.e. the servos do not move and are "soft", and (modern) electronic speed controllers stay OFF, because the signal is absent. Nevertheless, it makes sense to secure the model and keep well clear of hazardous parts.

**9.1 Automatic servo channel count detection**

When the RF channel is set, the receiver also detects the how many servo channels are transmitted (e.g. PPM 5, PPM 9), and stores this information. Every time the receiver is switched on, it checks the servo channel count and compares it to the stored value. If the two are not the same, the receiver remains inactive.



**! Note:**

Every time there is a change in the transmitter's servo channel count or operating mode (also when a different transmitter is used), the RF channel must be re-set (→ 9. ). The FAIL-SAFE settings (→ 11. ) must also be set again!

**9.2 Automatic Shift switching**

The FUSION 9 receiver can be operated with positive Shift (e.g. JR, AIRTRONICS, MULTIPLEX) and negative Shift (e.g. HiTEC, Futaba). The receiver automatically sets itself to the appropriate Shift while setting the channel. If you wish to use a transmitter with different Shift, you must re-set the RF channel (→ 9. ).

**10. IPD (INTELLIGENT PULSE DECODING)**

The FUSION 9 receiver feature an IPD decoder; the abbreviation IPD stands for Intelligent Pulse Decoding. The "intelligence" takes the form of a micro-processor which analyses the signals picked up from the transmitter, processes them (where necessary) and then passes them on to the servos. The received signals are not simply passed on directly to the servos, as with conventional FM/PPM receivers, but are checked for interference and validity.

For a full description of IPD technology, please visit [www.multiplexusa.com](http://www.multiplexusa.com)

**11. ACTIVATING FAIL-SAFE**

The effect of FAIL-SAFE setting is that if interference occurs the servos take up a pre-defined position, previously stored in the receiver. If FAIL-SAFE has not been activated (factory default state, or after a RESET (→ 13.)), the signal is switched off after the HOLD period (0.5 sec.). This means that the servos become "soft" and remain in their last commanded position under no load (this may equate to full-throttle!) until a valid signal is picked up again.

**! Note:**

In the interests of safety we recommend that FAIL-SAFE should always be activated, and the FAIL-SAFE settings should be selected so as to bring the model to a non-critical situation (e.g. motor idle / electric motor OFF, control surfaces neutral, airbrakes extended, aero-tow release open, ...).

**Sequence**

1. Switch on the transmitter, then the receiver. The LED flashes:



2. Move all the transmitter sticks and other controls to the desired FAIL-SAFE positions (e.g. motor idle, control surfaces neutral).
3. Press the button briefly (approx. 0.5 seconds); the LED goes out. ⇒ FAIL-SAFE is now active, and the FAIL-SAFE settings are stored.

**Note:**

If you hold the button pressed in for too long (> 2 sec. - until the LED comes on), the IPD filter is switched off (→ 12. ). In this case FAIL-SAFE is not activated, and the FAIL-SAFE settings are not stored!

4. Testing the FAIL-SAFE settings

Move the sticks to positions other than the FAIL-SAFE settings, then switch off the transmitter. The servos should now move to the FAIL-SAFE settings previously stored, once the HOLD period (0.5 sec.) has elapsed.

**Notes:**

- The FAIL-SAFE settings are only stored if the IPD filter is active, and if no errors are displayed:



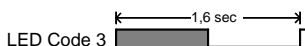
- If the transmission mode is changed (e.g. by using another TX 7ch → 9ch), you must re-set the FAIL-SAFE positions! (see also → 9.1. )
- The FAIL-SAFE settings must always be checked and brought up to date if, for example, you install the receiver in a new model, or make an accidental mistake in programming the receiver (→ 11.4 ).
- The maximum FAIL-SAFE duration is limited to 15 seconds. After this the servo signal is switched off ⇒ the servos become "soft", an electric motor speed controller switches off the motor in the absence of a signal. This eliminates the danger of jammed mechanical linkages stalling the servos (e.g. after a collision), which would usually wreck them.

**12. SWITCHING OFF THE IPD FILTER**

The IPD filter (→ 10. ) can be switched off if necessary. In this mode the receiver operates like a conventional FM/PPM unit, i.e. the signals picked up are passed directly to the servos (etc.). This can be useful, for example, to locate sources of problems to the receiver caused by the power system, or the arrangement of the receiving system components. The filter should always be switched off for range-checking, so that it does not filter out any interference (undesirable in this case). Changes can then be made as required.

**Sequence**

1. Switch the transmitter on, then switch the receiver on. The LED flashes:



2. Press the button (the LED goes out), and hold it pressed in until the LED comes on again (after about 2 seconds). The LED then flashes as follows:



You can re-activate the IPD filter by either of the following methods:

- Switch the receiver off, then on again
- or
- Hold the button pressed in again for > 2 seconds (see above)

**! Note:**

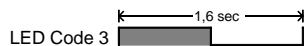
In the interests of safety the IPD filter should only be switched off for range checks or other experimental purposes. Normal operations should always be carried out with the IPD filter activated.

**13. RECEIVER RESET**

The receiver settings can be switched back to the factory default values. All settings (e.g. RF channel, FAIL-SAFE settings) are lost when you do this, and are reset to the factory defaults.

**Sequence**

1. Switch the transmitter on, then switch the receiver on. The LED flashes:



2. Press the button and hold it pressed in until the LED goes out - after about 10 seconds.

The LED now flashes the confirmation signal:



The signal output is switched off after you carry out a RESET. The receiver can only be used again after switching it off, then on again (→ 8. ).

A RESET can also be triggered without a transmitter signal. For this to work an RF channel must have been set previously.

**14. INSTALLATION NOTES**

- You should pack your receiver loosely in foam or similar material to protect it from vibration - especially with internal combustion motors.
- Install the receiver at least 6" away from electric motors, ignition systems and other electronic components. The receiver aerial should not run immediately next to these components.
- Brushed electric motors must be effectively suppressed.
- Use separation filters if you are using servo extension leads longer than 24".
- Do not alter the length of the aerial.
- Route the aerial out of the model and extend it in as straight a line as possible. Do not leave it coiled up.
- Do not deploy the receiver aerial parallel to servo leads, high-current cables or electrically conductive components (e.g. pushrods).
- Do not deploy the aerial inside or over model components which are skinned or reinforced with conductive materials (e.g. carbon fibre, metallic paints etc.), as they have a shielding effect.

**15. CARRYING OUT A RANGE CHECK**

It is very important to carry out regular range checks to ensure that the radio control system works reliably. These checks also allow you to detect problems and sources of interference in good time. This applies in particular when:

- you are using new or altered components, or you have changed the arrangement of components in the model;
- you are using radio control system components which were involved in a previous hard landing or crash;
- irregularities or problems have arisen during previous flights.

**Important:**

- For a range check install the telescopic transmitter aerial but leave it completely collapsed.

The range of the FUSION 9 receiver with transmitter aerial collapsed down to a single segment should be at least 150'. We recommend that you disable the IPD filter for range-checking, so that interference and irregularities are not suppressed. You have reached the range limit when the servos begin to jitter and move uncontrollably. **Important:** Carry out the initial range check with the motor or engine stopped. Repeat the check with the power system operating (all throttle settings): the range should not be significantly reduced. If it is much lower, seek out and eliminate the cause of the problem (motor interference, arrangement of the receiving system components and power supply, vibration, etc.).

**LED CODES**

LED Code 0	LED OFF	→ 8.
LED Code 1	LED ON	→ 8. / → 9.
LED Code 2	[Pulse train with 1.6 sec interval]	→ 9.
LED Code 3	[Pulse with 1.6 sec interval]	→ 8.
LED Code 4	[Pulse train with 1.6 sec interval]	→ 12.
LED Code 5	[Pulse train with 1.6 sec interval]	→ 9. / → 13.