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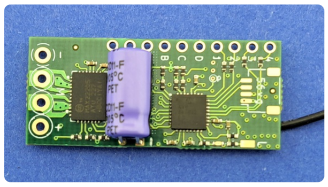
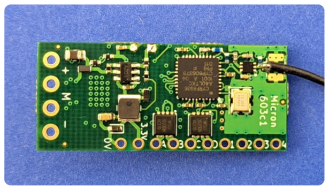
Micron MR603c 2.4GHz DSM2/DSMX Receiver (from v1.5)

This document is for MR603 from firmware version 1.5, other versions can be found via the table on page http://micronrc.co.uk/mr6xx_version.The most recent version of this document may also be found online at http://micronrc.uk/mr603-info where you will be able to view larger versions of the images.

The MR603c receiver is designed for use in larger scale model rail locomotives and road vehicles. It provides a 3A reversible ESC for brushed motors and 10 auxiliary outputs for lighting, sound triggers, couplers, etc. It operates on 2.4GHz and is compatible with any Spektrum DSM2 or DSMX transmitter including all of the Micron model rail transmitters. The voltage range is 5V to 20V.


MR603c Top


MR603c Bottom

MR603 requires binding with your transmitter before use. If purchased with a transmitter, it will be already bound to that transmitter. Once bound, the transmitter should be switched on before the MR603. If the transmitter is not switched on, MR603 will automatically enter bind mode 10 seconds after switch on; it may also be configured to bind only manually using pads P5 and P6.

The MR603 free-air range, when used with a Micron low-power transmitter, is 40m-50m and approximately 200m when used with a full-power (100mW) transmitter. This range will be reduced indoors due to absorption by furniture / fittings and reflections from metal surfaces. Range is also reduced if the receiver aerial is enclosed within a metal body. In this case, the extended aerial should be used and this is routed so that the active tip (last 30mm) is outside the vehicle body - e.g. though a small hole into the cab space. The aerial should not be cut short or made longer as this will affect operation of the receiver. It is important to perform a range check after installation to ensure you have full control of your loco/vehicle at all positions around the layout.

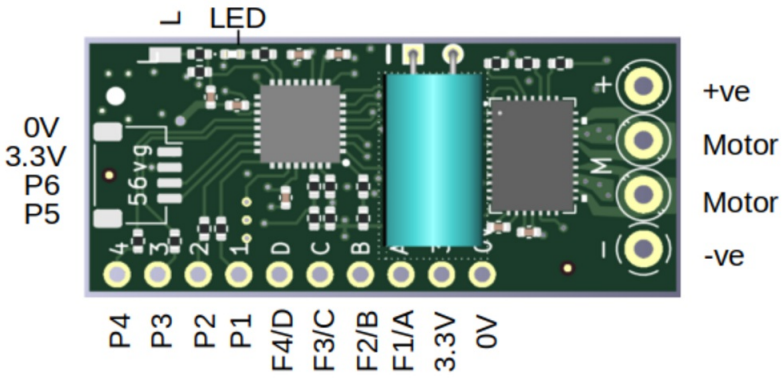
Features

- Compatible with all DSM2 and DSMX transmitters with up to 10 R/C channels, both Micron model rail and aero model stick type transmitters.
- 5V to 20V working voltage range.
- 10 auxiliary outputs: 4 x 'F' which are normally open switches capable of passing up to 2A; and 6 x 'P' which are 0V/3.3V logic outputs capable of supplying up to 20mA each. P outputs may also be configured to drive servos.
- Supports the Selecta feature for compatibility with multi-loco transmitters, MR603 must be re-bound to change Selecta switch position.
- 4 pre-installed configurations providing a usable set of receiver output to transmitter control mappings - see Configurations (end of document).
- Most pre-installed configurations provide auto-switched front and rear LED lights on P1 and P2 or F1 and F2
- The receiver on-board LED can be repeated to any non-servo output (this is called the LED2 function). The default for LED2 is on P1.
- Cruise control is enabled by default - the motor keeps running if the transmitter signal is temporarily lost. This can be disabled using a power-on configuration change or by programming.
- All functionality may be configured by programming using a suitable transmitter (most Micron tx or a stick type model aircraft tx).

Usage

- Do not bend the receiver circuit board
- Connect the positive and negative input pads to a suitable battery or power supply, via a on/off switch in the positive lead. A resettable fuse **must** be placed in the battery positive lead to protect the battery in the event of a wiring or component fault.
- Connect the 'M' pads to your vehicle motor, removing any connections to track pickups. The motor should be fitted with suppression capacitors to avoid injecting excessive electrical noise into the receiver; 100nF across the motor terminals and 100nF from each terminal to the motor case. If symptoms of motor noise interference persists, 10uH chokes in each motor lead usually solves the problem; the chokes must be rated for the maximum motor current.
- Connect any auxiliary circuits to the F and P pads; the 3.3V pads may be used for powering auxiliary circuits with a maximum of 20mA per pad.
- Protect the receiver board before applying power for testing. It must not be allowed to touch anything metal. If MR603 was purchased with the heatshink cover supplied loose, slide this over the circuit board.
- MR603 requires binding to a transmitter before use; if purchased with a transmitter, it will be ready bound (at Selecta pos #1, if the transmitter has a Selecta switch).
- MR603 has a single LED on the top near the 'L' input pad (see the diagram below). After switching on:
  - the LED will slow flash while MR603c is searching for its bound transmitter;
  - if not already bound, approx 10 seconds later the receiver will go into bind mode and the LED will show a rapid flash; switch your transmitter on in bind mode and the LED flashing will slow while the transmitter and receiver are synchronising and then light continuously. If the LED continues rapid flashing or the slower flashing does not stop, try again with the transmitter slightly further away from MR603 - for most transmitters, 50cm separation works well.
- When bound:
  - the LED will be on to show receipt of good data from the transmitter,
  - the LED may flicker due to electrical (e.g motor) noise, signal fades caused by reflections, interference from WiFi or Bluetooth signals, or overloading from the transmitter (this will happen if the transmitter is too close)
  - the LED will show a slow repeated flash if the transmitter signal is lost - e.g. if the vehicle has gone out of range for more than 1 second or you have switched the transmitter off
  - the LED will show a repeated double flash when MR603 is deselected (transmitter Selecta switch is moved)
  - the LED will show a repeated 5 flash if the low voltage cutoff has triggered
- After testing, apply the heatshrink cover if not already fitted.
- Fix the receiver in place and route the aerial so that the last 30mm can 'see' the transmitter for best range. Double sided foam-cored sticky tape is ideal for mounting the receiver.

Connections



MR603 has solder pads for:

- power input (positive & negative battery)
- motor output
- 3.3V from the on-board regulator which can supply a max of 200mA
- an additional battery negative connection (0V) - useful for wiring LEDs to P pads
- L: used to monitor battery voltage when a booster module is used, e.g. to raise a single LiPo cell to 12V.
- P1..P6: these are logic level outputs, 0V when off and 3.3V when on; they can be configured for on/off switching or to output a servo signal; P5 and P6 are at the opposite end of the board to the battery and motor pads, a 4 pin JST-SH socket may optional be fitted to carry these P outputs plus 0V and 3.3V
- F1..F4: these are FET switches capable of up to 2A; they are open circuit when off and connected to battery negative when on; a load should be wired between the F pad and battery positive, or the 3.3V pad for low current loads; labelled A..D on the receiver board and numbered 7..10 for programming

The power input and motor output pads have a 3.5mm spacing which allows use of a screw terminal (optionally available when MR603 is purchased). The long side pad spacing is 2.54mm which allows a pin header to be attached if plug connectors are preferred for the F and P outputs. A JST-SH 4 pin socket may optionally be fitted for P5, P6,

3.3V and 0V.

LEDs on P pads should be connected between the pad and battery negative (0V) with a series resistor appropriate to the required brightness. P1 to P4 have a series 120 ohm resistor on the PCB, P5 and P6 have no resistor. LEDs or incandescent lamps on F pads should be connected between the pad and battery positive or the 3.3V pad and with a series resistor appropriate to the voltage and required brightness.

Sound card inputs are usually 5V open circuit and are triggered when connected to negative. They should be connected to an F pad. A P pad may be used if you have more trigger inputs than F pads, or a P to F converter is available from Micron - this is a small board containing 1, 2, 3 or 6 FET switches. If the P output is used directly for sound card trigger, a 4k7 ohms resistor must be connected in series to avoid stressing the MR603 microprocessor; the P output should be configured for 3.3V idle and 0V when the Tx control is actioned.

Take care when soldering wires to the battery, motor, P and F pads as these are easily damaged by prolonged application of high temperature. A temperature controlled iron used with thin flux cored solder is best. Also, if using stranded wire, ensure that none of the strands 'escape' to short across adjacent pads. The recommended technique is to fill the pad hole with solder and then attach the wire to the top of the pad - i.e. don't pass the wire through the pad hole.

Low Voltage Cutoff

MR603 can be powered from a battery of 5V up to 20V. The speed controller will stop the motor if the battery drops below 5V but the other receiver functions will continue to operate down to 4V.

The default receiver setting is for the Low Voltage Cutoff (LVC) threshold to be determined from the voltage measured at switch on. This is **auto** mode which is essential when the receiver is powered using a Lithium battery (LiPo or LiIon) as these must not be discharged below 3V per cell. The algorithm used for this calculation means that a 9V Alkaline or NIMH battery can often be interpreted as an almost discharged 3S LiPo. The solution is to either disable LVC, or set it to the correct value for your battery. Switching between auto and disabled can be done using a power-on configuration change and the LVC threshold can be set to a specific value byprogramming the receiver.

LED Error Codes

If the receiver firmware detects a fault, all functions are disabled and the LED will display a repeated pattern of 0.5 seconds rapid flashing followed by a N-flash where N is the error code

Flash Count	Error
1	Rx firmware failed startup checks
2	radio transceiver failed initialisation
3	failed to read or write the configuration data
4	failed to write the configuration backup
5	failed to restore configuration from backup
6	a port (P or F output) is in an unexpected state

If your receiver displays an error code, cycle the power and contact Micron if the error persists.

Binding

MR603 must be bound to a transmitter before use. Once bound, MR603 remembers the transmitter identity and searches for this when it is switched on.

To bind a receiver, it is switched on with no transmitter active (for normal operation, the transmitter should be switched on before the receiver).

The default MR603 configuration is for autobind where the receiver automatically goes into bind mode approx 10 seconds after switching on with no pre-bound transmitter active. Manual binding may be configured by programming - this could be useful, for example, if the loco is to be used by children who could forget to switch the loco/receiver on first.

auto bind:
: The receiver enters bind mode approximately 10 seconds after power-on if it has either never been bound or it fails to find its bound transmitter.

manual bind:
: Pads P5 and P6 must be connected before switching the receiver on. If P5 and P6 have no soldered connections and the JST-SH socket is not installed, this can be achieved using needle nose tweezers pressed onto the pads. Alternatively, and necessary when the receiver is inaccessible, a switch can be wired to P5 and P6.

Bind mode is indicated by a rapid flashing of the receiver LED and the following steps should be followed to bind with your transmitter:

1. transmitter switched off

2. if Selecta is enabled, move the transmitter loco selection switch to the required position
3. switch on the receiver in bind mode (manual or auto)
4. only when the LED is flashing rapidly, hold down the transmitter bind button and switch on
5. wait for the transmitter to indicate that it is in bind mode and then release its bind button (the power LED on Micron model rail transmitters will flash when binding)
6. after a short delay, the MR603 LED flashing will slow for 2-5 seconds and then light continuously
7. the receiver is now bound to the transmitter

If the receiver LED does not come on solid (no flash) within 10-15 seconds, the bind process has failed. This can happen for several reasons and does not normally indicate a fault. During binding, the receiver searches for the transmitter's signal and this can be distorted by holding the transmitter and receiver too close. So, if you get a bind fail, try again after moving them slightly further apart or changing the relative orientation of the aerials. Binding is most reliable when no other 2.4GHz transmitters are turned on.

Loco Selection - Selecta

Many Micron model rail transmitters have a 12 way switch to allow control of up to 12 locos - Deltang originated this feature and called it 'Selecta'. Using the switch, locos are brought under control one at a time. When not selected, receiver outputs hold their current setting (e.g. a loco which is moving when deselected keeps moving) and the LED shows a 2-flash pattern. The default 'keep going' behaviour can be changed to stop when deselected by programming the receiver.

The Micron implementation of Loco Selection / Selecta is fully compatible with the Deltang Selecta feature and uses R/C channel 2 by default. When Selecta is enabled, the controlling R/C channel (e.g. 2) may still be mapped to a receiver output but, of course, this will not change as the transmitter switch is rotated.

The receiver has a 800ms delay before enabling when the transmitter Selecta value is changed. This is to avoid obeying the transmitter while the Selecta switch is being moved - e.g. a receiver on Selecta #4 should not change any outputs while the transmitter Selecta switch is moved from #3 to #5.

Selecta may be enabled by default (see the receiver configuration information) and may be enabled or disabled by using a power-on configuration change (see Power-On Configuration Changes) or by programming.

If Selecta is enabled, the transmitter's Selecta switch value will be saved when the transmitter and receiver are bound. A new Selecta value (i.e. switch position) can be stored either by rebinding or by using the power-on changes to disable and then re-enable Selecta.

Note: when the Selecta switch is changed to control a different loco, the newly selected loco responds to the transmitter control settings. The current range of Selecta enabled transmitters have no model memory so cannot have different throttle settings, etc. for each loco. Thus, although Selecta may be used to manage many moving locos, this **must be used with care** and is not recommended. Micron intends to introduce a transmitter with model memory but the release date is not known.

Directional Lighting

Most configurations have pads P1/P2 or F1/F2 setup to drive front and rear lights; P1/F1 powers a forward light and P2/F2 a backward facing light. The directional lighting pins can be changed by programming the receiver.

P1/P2 should be used for LEDs and F1/F2 for high voltage (e.g. incandescent) lights.

MR603 has an on-board 3.3V regulator and 120 ohm resistors in series with the P1 to P4 so limits the LED current to approximately 20mAh. Most high brightness LEDs require much less than this so an additional resistor should be used - e.g. 100 - 1k ohms. The LED should be connected between P1/P2 and battery negative (0V).

LEDs or high voltage lights should be connected between F1/F2 and either the 3.3V pad or battery positive (with and appropriate value series resistor).

The directional LEDs follow the throttle channel if configured for centre-off, changing when the throttle passes though the off position. If the throttle is configured for low-off, the LEDs change only when the throttle is at zero - i.e. the direction control can be altered at any time but the LEDs (and motor direction) changes only when the throttle is closed.

The throttle mode (centre or low off) can be changed by programming or by using one of the power-on configuration changes

Cruise Control / Failsafe

If the receiver loses the signal from the transmitter, for example when going through a tunnel or behind a garden building or some dense bushes, MR603 outputs hold their current setting until the transmitter signal is reacquired. The motor also continues running when a Selecta-enabled receiver (see Selecta) is de-selected.

This is a form of 'cruise control' which allows you to switch off the transmitter if, for example, you are running the loco round a continuous circuit.

Cruise control can be disabled using a Power-On Change or by programming. If cruise control is disabled, the receiver will 'fail safe' and the motor will be stopped when signal is lost.

Emergency Stop

Any of the transmitter controls can be used as an 'Emergency Stop' function to rapidly bring the loco/vehicle to a stop. Emergency Stop is not enabled by default and must be configured by programming the receiver.

To enable Emergency Stop, you need to choose:

- the R/C channel
- whether a low or high signal is used to trigger
- the delay before stopping - i.e. the number of seconds that the R/C channel must be in the trigger state before Emergency Stop is actioned

For example, the Tx22X transmitter button S2 (in-between the 2 toggle switches) could be used: this controls R/C channel 4 and the signal is low when the button is pressed.

Power-On Configuration Changes

A few configuration changes can be made without programming. A simple link across 2 of the auxiliary P pads is used to action the change. This is easily achieved using some needle nose tweezers and, if they are sharp pointed, can penetrate the receiver's heatshink cover. **Note:** there must be no other connections (e.g. LEDs) to the pads while attempting to make a power-on change.

A change is made by:

- connecting the appropriate P pads with the receiver off,
- switching the receiver on and observing the LED flash pattern,
- waiting until the flash pattern corresponds to the value you want to set
- removing the connection: the new value is written to permanent store and the change is confirmed by a continuous rapid LED flash; you need to switch off and back on again
    - the exception is P1/P2 option 5 to enter programming mode; after removing the connection, MR603 goes into receive mode with programming enabled

The changes all toggle (or cycle) the parameter value each time the process is performed. The LED flash indicates the new state of the configuration parameter. The receiver has to be switched off after the change as it will be stuck in the rapid flash mode to indicate that the change has been made. **If you switch off before removing the P connection, the configuration is not changed.**

This is a summary of the configuration changes that can be made using a jumper across 2 of the P pads.

Change	Pads	LED indication
Reset, Backup & Progamming	P1/P2	n-flash where 'n' is: 1: do nothing 2: reset 3: backup 4: disable/enable ch2/ch4 programming 5: enter programming mode
Selecta	P1/P3	1-flash - disabled 2-flash = enabled
Cruise Control	P1/P4	1-flash = disabled, stop in 4s after signal loss 2-flash = enabled
ESC Throttle Mode	P2/P3	1-flash = centre-off 2-flash = low-off
Configuration Select	P2/P4	n-flash where 'n' is the configuration number
LVC	P3/P4	1-flash = disabled 2=flash = enabled with battery voltage auto-detect

Each flash count is repeated twice and then increments to the next, cycling back to 1 when the max is reached.

- The flash count for 'Reset, Backup & Programming' always starts at 1,
- all others start at the currently configured value - e.g. if Selecta is currently enabled, the flash count for Selecta mode will start at 2

Remove the connection when the flash count is the value you want. To avoid hesitation inadvertenly causing the count to skip on to the next value, remove the connection when you see the first showing of the LED flashes.

Note:

- when changing the configuration number, any previous programming or power-on configuration changes (e.g. LVC or throttle centre/low off) will be over-written and will need to be done again.
- after making any programming or power-on changes, always make a backup (P1/P2 or 4,12 program) so that, should you later perform a P1/P2 reset, the receiver is restored to the setup you made and not the factory state.

Receiver Programming

The behaviour for each MR603 pad (ESC, F or P) can be changed using a bound transmitter. MR603 must first be put into programming mode and then the direction toggle switch, or elevator on a stick type transmitter, is used to enter a program sequence one digit at a time. The LED (and LED2 if enabled) flashes to indicate the value of the current step in the programming sequence. For example, if the current value is 4, the LED flashes 4 times, pauses and repeats - this is called a 4-flash.

The programming table is large and presented in a separate document (see micronrc.co.uk/mr6xx_progtable) which lists all of the functions that may be changed by programming. The table is split into 5 blocks of related functions each with the same value in the first column.

The table columns contain the program values which must be entered to change a particular function. For example, to change the throttle behaviour from centre-off (forward and reverse on one Tx control) to low-off (separate throttle/regulator and direction/reverser controls) the program sequence **1, 1, 2, 1, 3** is entered. Each digit of this program sequence is taken from the columns, left to right:

1 = ESC Configuration
1 = H1 (there is only 1 ESC on MR603)
2 = Low Off Throttle
1 = Throttle on R/C channel 1
3 = Direction control on R/C channel 3

One function can be changed at a time. The general method is:

- set receiver into programming mode
- enter a program sequence
- repeat until all programming changes have been made

Enter Programming Mode

There are 3 methods of getting the MR603 into programming mode:

1. use the P1/P2 power-on jumper to select option 5 (5-flash) to enter programming mode
2. switch the transmitter on and hold channel 2 and channel 4 controls at high or low extremes and then switch the receiver on; these are the F1 and F2 buttons on a Tx20v2 and the Selecta switch and S2 button on a Tx22X; the receiver LED will flash rapidly shortly after a signal is received from the transmitter, centre one or both channel 2 & 4 controls (e.g. release the buttons on Tx20v2 or the S2 button on Tx22X
   Note: the receiver always goes through an initialisation sequence after power is applied, so you must hold the ch2/ch4 control positions until a signal is received and the LED flashes rapidly.

3. switch the transmitter and receiver on (they must be bound), wait 5 seconds without touching any controls and then tap out morse SOS (... --- ...) on the transmitter bind button (or toggle the gear switch high to low for a stick transmitter);
   - dots (…) will be a quick press of the button and must be less than 1 second in duration
   - dashes (---) must be greater than 1 second and shorter than 5 seconds – 2 seconds is a reliable time
   - the time between each dot or dash must be less than 5 seconds

When programming mode has been successfully entered, the receiver LED will show a 1-flash - this is the **1** from the first column of the programming table. If you do not get the 1-flash, repeat the procedure to enter programming mode. It usually takes a couple of attempts to get the SOS method correct if you have never done it before.

Enter a Program Sequence

One programming change requires up to five choices to be made. These are called 'levels' and each has several options. They are documented in the programming table. Completion of a programming change exits programming mode and requires the receiver to be placed into programming mode again for the next change.

It is a good idea to write the programming sequence on a piece of scrap paper and cross off each digit as it is entered so that you don't lose track of where you are in the sequence. You always start at the top of the first column and 1-flash is displayed on entering programming mode.

- The flash count for a level is incremented by setting the R/C channel 3 control low and back to mid.
- The flash count for a level may be decremented by holding the R/C channel 4 control low while operating the R/C channel 3 control; R/C channel 4 is available on some Micron transmitters - e.g. F2 on Tx20v2 and S2 on Tx22X and Tx24v2
- The level value is accepted and the flash count for the next level is displayed by setting the R/C channel 3 control high and back to mid.

Most Micron transmitters have a toggle switch on R/C channel 3 which is marked A/B, or forward/reverse for a low-off transmitter:

- pushing the switch down (or toward 'reverse' for a low-off transmitter) sets the R/C channel to a low value and increments the flash count,

- pushing the switch up (or toward 'forward') sets the R/C channel to a high value, accepts the flash count and moves the program sequence on to next level or exits programming mode if the current level is the last in the sequence

Always return the toggle switch to centre after pushing down or up. Refer to the transmitter user manual for specific information on the R/C channel 3 control - Tx24v2 has a rotary reverse control.

The receiver LED will flash rapidly while R/C channel 3 is high or low and then return to a slower repeated flash when the control is back to the middle.

After accepting the flash count for a level, the LED displays a flash count for the current value of the next level. This could be higher than 1-flash if the function is set in the receiver configuration or has been previously programmed. For example:

- the default Selecta R/C channel is 2, so a 2-flash will be displayed after entering 4, 8, 2
- if P1 is configured as a front light, a 4-flash will be displayed after entering 3, 1

When the last level for a sequence has been accepted, the LED will light continously and the receiver is back in normal operating mode. The maximum number of levels is 5, but not all sequences use all 5; if level 5 in the table is blank, the LED will light continously after level 4 is accepted.

Programming changes are accepted **only** when the LED lights solid at the end of the sequence. If a mistake is made mid way through a sequence, switch the receiver off to abort.

Programming Examples
These examples assume MR603 is in as-received configuration and a Micron transmitter with toggle switch on R/C channel 3. Tx24v2 transmitters have a variable control on R/C channel 3 - the Reverser; the equivalent actions are:

Action	Tx with toggle switch	Tx24v2 type transmitter
Increment flash count:	toggle down	Reverser fully CCW (reverse) and back to centre
Accept flash count:	toggle up	Reverser fully CW (forward) and back to centre

1. **Set P4 as servo on R/C channel 7**
   program sequence: 2, 4, 1, 6
   - enter programming mode
   - LED shows 1-flash (level 1, 1=ESC)
   - toggle down and release once, LED shows 2-flash (level 1, 2=servo)
   - toggle up and release, LED shows 1-flash (level 2, 1=P1)
   - toggle down and release 3 times, LED shows 4-flash (level 2, 4=P4)
   - toggle up and release, LED shows 1-flash (level 3, 1=servo)
   - toggle up and release, LED shows 1-flash (level 4, 1=R/C chan 1 - P4 was prevously a momentary on/off output)
   - toggle down and release 6 times, LED shows 7-flash (level 4, 7=R/C chan 7)
   - toggle up and release, LED shows 1-flash (level 5, 1=normal speed)
   - toggle up and release, LED lights continously and servo on P4 responds to R/C channel 7
2. **Reverse servo on P4**
   program sequence: 2, 4, 7, 1
   - enter programming mode
   - LED shows 1-flash (level 1, 1=core)
   - toggle down and release once, LED shows 2-flash (level 1, 2=servo)
   - toggle up and release, LED shows 1-flash (level 2, 1=P1)
   - toggle down and release 3 times, LED shows 3-flash (level 2, 4=P4)
   - toggle up and release, LED shows 1-flash (level 3, 1=normal servo)
   - toggle down and release 6 times LED shows 7-flash (level 3, 7=adjust servo
   - toggle up and release, LED shows 1-flash (level 4, 1=reverse servo direction)
   - toggle up and release, LED lights continously and servo on P4 rotates in the opposite direction
3. **Set D/F4 as momentary on/off output, on when R/C channel 4 is low**
   program sequence: 3, 10, 1, 4, 1
   - enter programming mode
   - toggle down and release 2 times, LED shows 3-flash (level 1, 3=On/Off Configuration)
   - toggle up and release, LED shows 1-flash (level 2, 1=P1)
   - toggle down and release 9 times, LED shows 10-flash (level 2, 10=F4/D)
   - toggle up and release, LED shows 1-flash (level 3, 1=momentary)
   - toggle up and release, LED shows 1-flash (level 4, 1=R/C chan 1)
   - toggle down and release 3 times, LED shows 4-flash (level 4, 4=R/C chan 4)
   - toggle up and release, LED shows 1-flash (level 5, 1=idle off, on when ch is low)
   - toggle up and release, LED lights continously and D/F4 switches on when Tx20v2 F2 or Tx22X S2 are pressed)

The programming table for MR603 can be found at micronrc.co.uk/mr6xx_progtable.

Servo Throw Adjustment

Servo throws (low and high end points) can be configured using a bound transmitter, the servo centre position will always be at the mid-point of the low and high travel. To adjust a servo, the servo output is selected first and then the travel adjusted using either the throttle control or direction toggle if the throttle servo is being adjusted.

The steps below assume a Micron transmitter is being used. If the transmitter is an aeroplane type stick transmitter then the elevator stick corresponds to the direction toggle.

- put the receiver into programming mode (see above)
- enter the program sequence **2, P, 7, 2**, where P is the output port number (e.g. 3 for P3)
- within 5 seconds, move the control for the output being adjusted to the end that needs adjustment:
- use the direction toggle or throttle control to increase or decrease the servo travel:
    - use the throttle control if the direction (R/C channel 3) servo is being adjusted, or
        - hold throttle knob fully CCW to decrease travel
        - hold throttle knob fully CW to increase travel
    - use the direction toggle for all other servos
        - hold toggle down to decrease travel
        - hold toggle up to increase travel

  the receiver LED will flash twice per second as the servo travel is being adjusted and stop flashing when the limit is reached.
- centre both controls to finish the adjustment, the receiver will return to normal operating mode after the control corresponding to the P port being adjusted has been centred for 5 seconds.

Only one servo output can be changed at a time. Go through the above steps to adjust a different servo output pin.

Configurations

This configuration table is for firmware version 1.9. For other versions, refer to mrxxx_version.

The pre-loaded configurations are shown below. Unless otherwise specified when the receiver was ordered, config 1 is enabled by default. The other loaded configurations can be selected using a power-on configuration change or by programming.

Port	1: Centre-off throttle	2: MyLocoSound triggers on A-D (Tx22)	3: MyLocoSound triggers on A-D (Tx20)	4: Road Vehicle
H1	Centre-Off ch1	Centre-Off ch1	Centre-Off ch1	Centre-Off ch3
P1	Forward Light on H1 (LED2)	Forward Light on H1 (LED2)	Forward Light on H1 (LED2)	Servo on ch2 Steering
P2	Reverse Light on H1	Reverse Light on H1	Reverse Light on H1	Left indicator activate=ch4, steer=ch2 (LED2)
P3	Momentary on ch3, low 3.3V	Momentary on ch3, low 3.3V	Momentary on ch3, low 3.3V	Right indicator
P4	Momentary on ch3, high 3.3V	Momentary on ch3, high 3.3V	Momentary on ch3, high 3.3V	Brake Light on H1
P5	power switch enable, active HIGH	power switch enable, active HIGH	power switch enable, active HIGH	Reverse Light on H1
P6	power switch sense, active LOW	power switch sense, active LOW	power switch sense, active LOW	Momentary on ch1, high 3.3V Driving lights
F1/A/P7	Forward Light on H1	Momentary on ch3, high closed	Momentary on ch2, low closed	Momentary on ch3, high closed
F2/B/P8	Reverse Light on H1	Momentary on ch3, low closed	Momentary on ch4, low closed	Momentary on ch3, low closed
F3/C/P9	Momentary on ch5, low closed	Momentary on ch5, low closed	Momentary on ch5, low closed	Momentary on ch5, low closed
F4/D/P10	Latch on ch5, start open, toggle low	Latch on ch5, start open, toggle low	Latch on ch5, start open, toggle low	Latch on ch5, start open, toggle low
LED2	P1	P1	P1	P2
Selecta	Disabled	Disabled	Disabled	Disabled
LVC	Enabled	Enabled	Enabled	Enabled
Sleep time	1 hour	1 hour	1 hour	1 hour
Cruise	Enabled	Enabled	Enabled	Enabled

Other configurations are available to special order or you can configure yourself by programming.