

MERCURY™ SHIELDED FM RECEIVER

OPERATING INSTRUCTIONS

Chrome-Shield
Protection



NOVAK
ELECTRONICS, INC. RACING TEAM

THE NOVAK MERCURY FM RECEIVER

The Mercury Shielded FM is a narrow band micro-receiver designed for use in R/C surface models. The Mercury is the R/C car industry's first Chrome-Shielded receiver. The benefit of Chrome Shielding is that it helps reject interfering signals for increased immunity to radio noise.

The Mercury's superior Adjacent Channel Rejection allows for usability with all of the odd and even channels on 27 and 75 MHz frequencies. Low voltage operation (down to 3.0 volts DC) and Solid State RVP™ (Reverse Voltage Protection) make this star bright and tough.

Other features include an external battery slot, surface-mount components, and the ability to use either a Futaba J or Airtronics DSC (direct servo control) harness. Plug plastics are included for compatibility with non-Futaba J radios.

SPECIFICATIONS

Case Size	1.10 x 1.54 x 0.47 in. (2.79 x 3.91 x 1.19 cm)
Weight	0.65 oz. (18.4 g)
Modulation	FM
Number of Channels	2
Antenna Length	18 in. (45.72 cm)
Usable Sensitivity	3.0 microvolts
Selectivity	6 dB at ± 3 KHz
Adjacent Channel Rejection	>80 dB at ± 8.5 KHz
Voltage Range	3.0 to 10.0 volts DC
Current Consumption	12.0 mA over full voltage range
3OIP (Third Order Intercept Point)	+4 dBm

CHROME-SHIELD PROTECTION™

The Mercury is the R/C car industry's first Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) protected receiver, which is made possible with Novak's **Chrome-Shield Protection™**. Chrome-Shield is the result of a metalizing process that deposits a thin layer of highly conductive metal directly onto the plastic case, providing the Mercury with superior noise attenuation. *The Mercury far exceeds the new FCC 1999 Radiation Limits.*

Many receivers are affected by noise coming from the chassis, but by plating the Mercury's case in chrome (both the inside and outside) the noise from the motor, battery, speed control and servo is greatly reduced.

If dirt, oil or fingerprints get on the Mercury's case, and you would like to have it restored to its original shine, we recommend cleaning the case with rubbing alcohol and a soft cloth.

NOTE: The Mercury is not water-proof and is susceptible to moisture. A Mercury replacement case is available in Novak Kit #5660 (27 & 75 MHz) and #5665 (29, 35, 40, 41 & 72 MHz).

STEP 1

RADIO CRYSTALS: SELECTION, CARE & INSTALLATION

The Mercury FM receiver has been factory tuned and does not need further tuning. Crystals are not included with the receiver.

1. Only use single conversion FM band crystals.
2. The color of the antenna wire indicates the frequency band of the receiver.

Black	27 MHz	*Yellow	40 MHz	*Not available
*Red	29 MHz	*Yel/White ...	41 MHz	in the U.S.
*Orange ...	35 MHz	Green	75 MHz	
3. The transmitter and receiver crystals MUST be made by the transmitter manufacturer and be on the same radio band and frequency (e.g. Airtronics 27 MHz transmitter crystal must be used with an Airtronics 27 MHz receiver crystal). Receiver crystals are usually marked "RX".
4. Since crystals are sensitive to vibration, they should not be dropped. Receiver crystals can be damaged by a hard crash.
5. To install, carefully insert the receiver crystal into the receiver by guiding the two prongs into the crystal socket holes. Crystals are non-polarized and can be inserted in either direction.

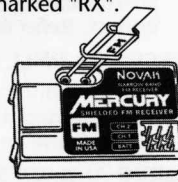


FIGURE 1 Proper crystal installation

STEP 2

CHANGING THE INPUT PLUGS

Instructions are listed below based upon the plug type of your radio system (servo, speed control, external battery pack).

Futaba J Plugs: The Mercury's connection slots are Futaba J Plug style. Proceed to STEP 3.

JR, Hitec, new style KO, and Sanwa/Airtronics "Z" Connector Plugs: These style plugs will fit into the slots of the Mercury without modification. *The brown wire of the JR, and the black wire of the Hitec, new KO and new Airtronics "Z" harness should be closest to the outside edge of the case. Proceed to STEP 3.*

Old style KO and Sanwa/Airtronics Plugs: The plug plastics must be changed to the Futaba J style by using the included Novak Futaba J style plug plastics. *Refer to Figures 2-5 to change plug.*

STEP 2: Changing the Input Plugs (continued)

FIGURE 2 With a small flat blade screwdriver, press on each of the three metal prongs until the wires are easy to remove. Remove wires.

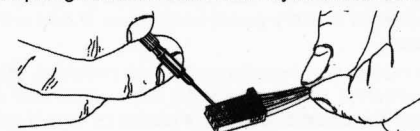
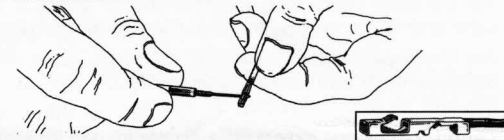


FIGURE 3 With the screwdriver, carefully lift the metal locking tabs to the angle shown below.



Insert each pin into the correct plug slot. Each pin should "click" into place. Locking tab must not extend outside the plastic plug housing.

FIGURE 4 For Old-Style KO Harness: Black wire inserts into the BLK terminal. Red wire inserts into the middle terminal. Blue wire inserts into the WHT terminal.



FIGURE 5 For Old-Style Airtronics/Sanwa Harness: Middle black wire inserts into the BLK terminal. Outside black wire inserts into the WHT terminal. Red wire inserts into the middle terminal.



CAUTION: Improper installation of these wires may cause damage to the receiver, servo and speed control.

STEP 3

MOUNTING THE MERCURY FM RECEIVER

Sudden jolts (e.g. when the car hits a board, lands after a jump, or crashes) send vibrations throughout the vehicle and components mounted in it. If vibrations reach the receiver, they can cause the crystal or an internal ceramic filter to shift frequency and lose reception. This leads to glitching and, in some cases, failure of these components. **Proper mounting will improve the Mercury's performance and reliability.**

1. **For Electric Cars & Boats:** To reduce vibrations received, mount the Mercury with the included double-sided tape. After mounting, you should be able to move the receiver with a rubber-type action. If using thinner mounting tape than what is provided, we recommend using several pieces. For Gas Cars & Boats: The Mercury should be mounted in foam rubber and protected from fuel and water.

Do not use glue to mount the receiver!

Caution: For maximum performance, the electronics are grounded to the chrome on the inside of the case. To prevent damage to the receiver, electronic speed control, or both, the Mercury Receiver's chrome case must not come in direct contact with the battery, chassis, or any other conductive surface in your vehicle.

2. Make sure the case edges do not come in contact with the chassis or battery box, as this will transmit vibrations directly into the electronics.

(continued)

STEP 3: Mounting the Mercury FM Receiver (continued)

NOTE: Since the Mercury's case is chrome, it is conductive. Damage to electronic components (e.g. speed control, servo, external battery pack) may occur if any wires short to the case.

If for any reason you experience a range problem, try mounting the receiver on its side with the crystal and antenna away from the chassis. Use extra pieces of tape if necessary.

3. Mount the antenna as close to the receiver as possible.

For Off-Road Cars: Run the antenna up a plastic antenna tube and let the excess trail out the top of the tube.

For On-Road Cars: Attach the antenna to a fiberglass antenna mast with several pieces of 1/4" heat shrink tubing and let the excess trail off the top.

Do not cut or coil excess wire, or range will be reduced.

STEP 4

HOOK-UP INSTRUCTIONS

MOTOR CAPACITOR & DIODE INSTALLATION

Refer to Figure 6

1. To prevent radio interference, capacitors **MUST** be installed on **EVERY** motor. Solder the three included 0.1µF (50 V), non-polarized, ceramic capacitors between:

- **POSITIVE (+)** motor tab & **NEGATIVE (-)** motor tab.
- **POSITIVE (+)** motor tab & **GROUND** tab*.
- **NEGATIVE (-)** motor tab & **GROUND** tab*.

Extra 0.1µF motor capacitors available in Novak Kit #5620.

2. An external Schottky diode must be used if the speed control's instructions indicate that one is needed. **Never use a Schottky diode with a reversible speed control.** See the speed control's instructions for proper Schottky diode information and installation.

Schottky diodes available in Novak Kit #5640.

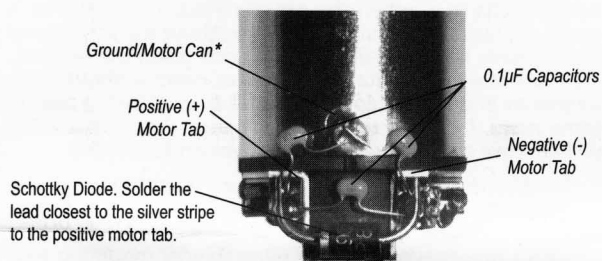


FIGURE 6 Capacitor and Schottky diode installation. Install Schottky diode if speed control instructions indicate that one is needed.

**If your motor does not have a ground tab, solder the capacitor leads to the can of the motor, as shown above. The plating may have to be removed with a file.*

SERVO & SPEED CONTROL CONNECTION

1. Plug the steering servo into channel one (CH 1).
2. Plug the electronic speed control into channel two (CH 2). When using a mechanical speed control or for gas models, plug the throttle servo into Channel two.
3. If you are using an external receiver battery pack, proceed to **STEP 5**. Otherwise, put tape or a decal over the BATT slot.

STEP 5

USING AN EXTERNAL RECEIVER BATTERY PACK

A 5-cell external receiver battery pack is recommended if erratic radio operation is experienced during hard acceleration. There are a few methods of using an external receiver battery pack. Because the speed control may be damaged by using an external receiver battery pack, we recommend you refer to your speed control's instruction manual for proper installation.

If you will be using an external receiver battery pack, plug it into the BATT slot as shown in **Figure 7**.

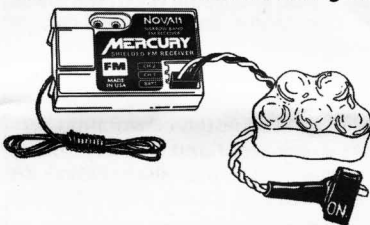


FIGURE 7 External receiver battery pack plugs into BATT slot.

TROUBLE-SHOOTING GUIDE

This section describes possible receiver problems, causes and solutions. For additional help, call for technical assistance.

RECEIVER GLITCHES AND/OR CAR STUTTERS

- Motor capacitors not installed or have broken.
- Receiver and/or antenna not mounted properly. **See STEP 3**
- Bad connections. Check power plugs or solder joints.
- Bad transmitter and/or receiver crystal. Try a new set.
- Voltage to the receiver is too low. Try using an external receiver battery pack.
- Motor brushes need to be replaced if they are worn or damaged. Motor may be noisy—rebuild or replace.
- Narrow band ceramic filter has been damaged from a hard impact. **Refer to Service Procedures**

RECEIVER WILL NOT OPERATE

- Bad transmitter and/or receiver crystal. Try a new set.
- Moisture might have settled inside of the receiver. Open receiver case and dry the case and electronics.

SERVO AND/OR SPEED CONTROL DOES NOT FUNCTION

- Input harness not wired properly. **See STEP 2**
- Input plug is plugged into wrong channel.
- Speed control not plugged into battery pack.

FCC APPROVAL NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try correcting the interference by one or more of the following measures:

- Reorient or relocate the receiver's antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or an experienced radio/TV technician for help.

MERCURY™
SHIELDED FM RECEIVER

SERVICE PROCEDURES

Before sending your Mercury in for service, review the Trouble-Shooting Guide and Instructions. The receiver may appear to need service when other problems exist in the system (such as a problematic transmitter, servo, speed control, battery, connectors or motor).

PLEASE NOTE: Receivers that operate normally when received will be charged a minimum service fee and return shipping costs.

WHAT TO SEND: Fill out all of the requested information on the enclosed **RECEIVER SERVICE CARD** and return it with your receiver. Service cards can also be downloaded from our website at www.teamnovak.com.

WARRANTY WORK: For warranty service work, you **MUST CLAIM WARRANTY** on the **RECEIVER SERVICE CARD** and include a valid, dated, cash register receipt, or an invoice from previous service work. If any warranty provisions have been voided there will be a service charge.

SERVICE COSTS: Customer is responsible for service costs (parts, labor and shipping/handling charges). Receivers are returned UPS/COD CASH ONLY. See **RECEIVER SERVICE CARD** for other payment and shipping options.

FOR SERVICE, SEND RECEIVERS TO:

Novak Electronics, Inc.
Attn: Service Department
18910 Teller Ave., Irvine, CA. 92612 USA

CUSTOMER SERVICE HOURS (PST):

M-Th: 8am-5pm; F: 8am-4pm (Closed every other Friday)
(949) 833-8873 • FAX (949) 833-1631

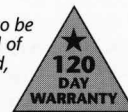
Visit us at www.teamnovak.com

PRODUCT WARRANTY

Novak Electronics, Inc. guarantees the Mercury FM receiver to be free from defects in material and workmanship for a period of 120 days from original date of purchase (verified by dated, itemized sales receipt). Warranty does not cover incorrect installation, components worn by use, altering the antenna, exceeding the recommended input voltage, using the wrong crystal(s), improper use of external receiver battery pack, using the receiver without its case, tampering with the electronics, allowing water, moisture, or any foreign material to enter receiver or come in contact with the PC board, component damage due to excessive force, incorrect installation of alternate input plug plastic, damage due to case shorts, or any damage caused by a crash.

In no case shall our liability exceed product's original cost. We reserve the right to modify warranty provisions without notice.

Because Novak Electronics, Inc. has no control over the connection and use of the receiver, no liability may be assumed nor will be accepted for any damage resulting from use of this product. Every receiver is thoroughly tested and tuned before leaving our facility, and is therefore considered operational. By the act of connecting and/or operating this receiver, the user accepts all resulting liability.



©1998 Novak Electronics, Inc. • All Rights Reserved • No part of these operating instructions may be reproduced without the written permission of Novak Electronics, Inc. • The Mercury Shielded FM Receiver was designed and manufactured in the USA. The Mercury Shielded FM Receiver™ and Chrome Shield Protection™ are trademarks of Novak Electronics, Inc.

Printed in the U.S.A. 5/98

#IM-2375-2