

MFJ

Mobile Transceiver Protector

Model MFJ-4402



INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment

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DISCLAIMER

Information in this manual is designed for user purposes only and is not intended to supersede information contained in customer regulations, technical manuals/documents, positional handbooks, or other official publications. The copy of this manual provided to the customer will not be updated to reflect current data.

Customers using this manual should report errors or omissions, recommendations for improvements, or other comments to:

MFJ Enterprises,
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Table of Contents

The MFJ-4402 Mobile Transceiver Protector 1
Specifications 2
Installation 2
 Radio is Already Installed 3
 Radio and Power Lines Not Installed Yet 4
Ignition Sense Line Installation 5
 Checkout and Operation 6
 Adjustments 6
 Timer Adjustment 6
 Undervoltage Cutout 6
 Fuse Replacement 6
 Powerpole® Connector Assembly 7
Additional Materials That May Be Needed 8
Schematic 9
Troubleshooting 9
NOTES 11
FULL 12-MONTH WARRANTY 12

THE MFJ-4402 MOBILE TRANSCEIVER PROTECTOR

This little box helps protect your mobile radio from a number of power related problems found in vehicles these days

There are times when during starting of the vehicle the battery voltage will sag to levels that will cause your radio's controller to act up or corrupt the internal memory. Some of these symptoms include the radio not powering up correctly, memory channels lost, and service and setup memory (hidden menus) being corrupted. Even with the power switch off some of the circuits still have power on them. The MFJ-4402 has a delay timer circuit controlled from the ignition sense line insuring your radio does not turn on till your vehicle has started and the voltage has reached normal levels. This is done by disconnecting the power till the time out period is completed.

Another issue is operating the radio while the engine is off. At some point the battery voltage will drop to the point that the radio may not operate correctly such as distorted audio, frequency shifting with modulation, or even the voltage dropping to the point that the vehicle will not start. The MFJ-4402 has a circuit to cut the radio off before the voltage gets down too low for proper operation.

A third issue that occasionally happens is leakage currents in the portions of the radio that do not get disconnected when the power is turned off rise to levels that can discharge batteries, especially batteries that are near the end of their life. The MFJ-4402 disconnects the power to the radio completely from the positive line to the battery insuring that a radio with high current leakage will not be the cause of a dead battery.

A fourth issue is a problem with electrical surges. The regulator in the alternator can go bad causing excessive voltages, sudden changes in loads causing momentary overshoots of the alternator voltage and jumping off other cars causing voltage spikes, or even worse a truck with a 24V electrical system trying to jump off your car. The internal Transient Surge Protector and the fuse make a protective circuit to catch momentary spikes and blowing the fuse on extended voltage spikes. The protector will also blow the fuse if the voltage is reversed on the battery power leads.

Connections between the MFJ-4402 and the vehicle and the radio are made through Anderson *Powerpole*[®] connectors for the high current lines and a quick disconnect connector for the ignition sense line. A 30A (max) fuse is used to protect for over current and reverse voltages.

SPECIFICATIONS

Time Delay	2 to 6.5 sec set to 4 sec
Low Voltage Dropout	10.25 to 12.4 volts set to 10.8V Pickup at 10.3 to 12.42 volts
Surge Clamping Voltage	21.2V
Max Radio Current	30A
Ignition Sense Current	120mA

INSTALLATION

Plan the installation out before actually cutting wire or drilling holes. Make sure you have the tools needed to complete the job and the additional hardware to properly wire to the car before starting the job. A little planning will save hours running down to the auto parts or electronics store for forgotten connectors or parts.

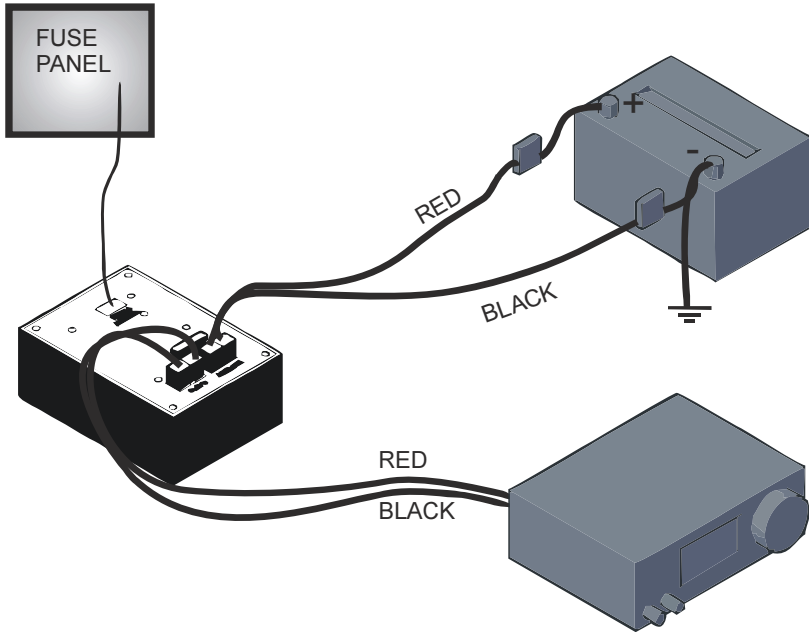
Install the MFJ-4402 in a convenient out of the way place that is not exposed to outside conditions. The MFJ-4402 is not waterproof or made for exterior use.

Do not use on positive ground vehicles. The MFJ-4402 is designed for negative ground 12V electrical systems only.

WHEN WORKING AROUND THE BATTERY IT IS RECOMMENDED TO DISCONNECT THE BATTERY TERMINALS TO REDUCE THE CHANCE OF A SHORT CIRCUIT. A SHORT CIRCUIT CAN CAUSE THE BATTERY TO EXPLODE.

Note: The wiring requires connections to the battery and an accessory connection in the fuse box. If you are not comfortable in making these connections take your vehicle to a qualified auto electric technician or someone experienced in mobile equipment installation.

The RED terminals and wires are always connected to the POSITIVE connections and the BLACK terminals and connections are always connected to the NEGATIVE or GROUND connections.



Radio is Already Installed

If the radio has already been installed and there is enough slack to connect the MFJ-4402 then the job of installation is simplified. The assumption in this section is the original installation does not use *Anderson Powerpoles*[®] to connect the radio to the power lines. If it does then you can skip the *Powerpole*[®] installation and go to step 4.

When wiring make sure that the RED terminals go on the positive wires which should be red and the BLACK terminals go on the negative wires which should be black.

1. Remove the fuses in the line to the battery.
2. Cut the cable where the MFJ-4402 is to be installed.
3. Install *Powerpoles*[®] on each end of the cut cable.
4. Make sure the *Powerpole*[®] connectors are put together to match the connectors on the MFJ-4402. Red to RED and BLACK to BLACK.
5. Connect the line from the battery to the terminals marked BATTERY.
6. Connect the line from the radio to the terminals marked RADIO.
7. Reinstall the fuses in the line to the battery.

Radio and Power Lines Not Installed Yet

Because each vehicle installation is different, complete exact instructions would be impractical. It would be wise to study mobile installation techniques in the various amateur radio books and magazines before proceeding. Also check with the manufacturer or dealer to see if they have any information on two way radio, CB radio, or Aftermarket Audio System installation in your vehicle. If you are not comfortable with the installation find experienced assistance or professional help. If you have to drill holes or drive screws make sure you do not screw into or drill into vehicular wiring or equipment. In running the wires do not route them in areas that can interfere with the foot pedals, mechanical assemblies, exhaust lines, fuel lines, or other moving parts under the hood or in the vehicle cabin. Use wire ties to tie down the cables so they can not shift and cause a hazard. Do not install the fuses till the wiring is complete.

Connections to the battery should be done properly using connectors designed for the job. Loosening the bolt and stuffing the wire behind the bolt is not recommended. Corrosion and reliability issues will show up in the future. Good quality, properly sized solder lugs, special terminals, or special side mount bolts that have screw terminals to replace the existing side mount bolts are strongly recommended. These should be available at well stocked auto parts stores.

1. Connect a power line set to the battery with fuses at the battery to protect the cables in case of short. Route the power line set through the firewall into the cabin of the vehicle being very careful to not damage the vehicle or interfere with the vehicle operation. Also route the lines so the insulation will not chafe and short to the chassis.
2. Run the power lines to where the MFJ-4402 will be placed allowing some extra slack if needed.
3. Install *Powerpoles*® on the lines to the battery. Make sure the *Powerpole*® connectors are put together to match the connectors on the MFJ-4402. RED to RED and BLACK to BLACK.
4. Run the power lines from the radio to the location of the MFJ-4402.
5. Put *Powerpole*® connectors on the lines from the radio to the MFJ-4402. Make sure the *Powerpole*® connectors are put together to match the connectors on the MFJ-4402. RED to RED and BLACK to BLACK.

Use the shortest practical wire lengths to reduce the voltage drop in the wiring.

IGNITION SENSE LINE INSTALLATION

Installation of the IGNITION SENSE line into the fuse box will take some care to insure that the fuse holders are not damaged or the fuse box is not shorted out. Study the vehicle owner's manual to insure you do not connect to a fuse that could cause the car to malfunction.

If you are not comfortable with the installation find experienced assistance or professional help.

Connectors may be needed to safely connect to the fuse box. Once you identify what these connectors are, they can be obtained from auto parts stores or electronics supply stores. The object is to find a connection that is switched by the ignition switch preferably the accessory circuit. Check with the dealer to find out if there are connections that can be used for this purpose. The best connection would be a bayonet lug connection supplying switched accessory power. The next choice is one of the fuses that are on the accessory circuit. This would be a fuse to the switched line on the radio or other similar circuit. Use a voltmeter and identify the fuse that is switched on with the accessory position and the on position of the key switch.

DO NOT USE A FUSE CONNECTION THAT POWERS HEADLIGHTS, BRAKES, AIRBAGS, IGNITION SYSTEMS, COMPUTER SYSTEMS, OR ANY SAFETY DEVICE ON THE CAR. INTERRUPTING THESE SYSTEMS CAN CAUSE THE CAR TO MALFUNCTION.

If tapping a fuse connection, use adapters that are designed for this job. Just pushing a bare wire in between the fuse lug and the socket is not safe. Stray wire strands can short out the block. Follow the instructions with the adapters to insure they are installed correctly. Put the connector on the fused side of the fuse to protect the connection and wire in case of a short circuit.

Do not cut and tap a wire in any wiring harness to obtain the switched power. Cutting and splicing wires can cause electrical problems in the car and even if covered with electrical tape the tape can come off over time causing a chance of a short in the wiring. Tapping the wrong wire can cause severe problems in the vehicle.

Once the Acc. power source has been identified run a wire between the MFJ-4402 and the fuse box. Use the proper connector at the fuse box side and a standard *insulated* female quick disconnect connector (supplied) at the MFJ-4402. In running the wires do not route them in areas that can interfere with the foot pedals, mechanical assemblies, or other moving parts under the dash or in the vehicle cabin. Use wire ties to tie down the cables so they can not shift and cause a hazard.

Carefully crimp on the connectors following the instructions with the connectors if any. Use the proper crimp tools when available. It is suggested to solder the connectors on where possible to insure both a mechanical and electrical connection that will not pull apart later. For the supplied connector remember to put the plastic boot on first before putting on the connector then slide it over the connector to insulate it.

Checkout and Operation

1. Install the fuses at the battery.
2. Plug in the battery line to the BATTERY connector and the radio line to the RADIO connector if not already done so.
3. Plug in IGNITION SENSE line if not already done so.
4. Turn the ignition switch to Acc.
5. The relay and the radio should energize after 4 to 6 seconds.

Normal operation, when you turn on the car the relay will be delayed long enough to allow the car to start and then turn on the radio. The time delay can be adjusted to lengthen or shorten the delay as needed.

It is possible to connect more than 1 radio to the MFJ-4402 as long as the total current does not exceed 30 amps or the maximum fuse size you are currently using. Use pigtail set to connect both radios, or a box such as the MFJ-1106 and a short jumper cable.

Adjustments

Timer Adjustment

1. Using a small tuning tool or jeweler's screwdriver turn the DELAY SET control (R5) for the desired delay after turn on. Range is approximately 2 seconds to 8 seconds. Mid range is approximately 4 seconds

Undervoltage Cutout

1. Adjustment range is approximately 10 to 12.5V. Mid range is approximately 10.8V.
2. This adjustment requires an adjustable power supply to properly set the level.
3. Remove the MFJ-4402 from the vehicle.
4. Connect an adjustable power supply to the MFJ-4402 with the negative connection to either of the BLACK *Powerpole*[®] connections and the positive to the IGNITION SENSE line input.
5. Adjust the power supply to the desired low voltage cutout level. This is usually the minimum level the radio manufacturer specifies or a little higher than the minimum that the vehicle will start at.
6. Adjust the LV SET pot using a small tuning tool or jeweler's screwdriver and adjust the level to where the relay drops out then turn to where the relay just energizes.
7. Turn the voltage on the power supply up and down around the set point to verify that the relay drops out and energizes at the desired point.
8. Reinstall the MFJ-4402 in the vehicle.

Fuse Replacement

If for some reason the fuse blows identify the cause for the failure and repair the problem. Replace the fuse with one of the same type and of the value the radio manufacturer recommends for the radio. Do not install a fuse above 30 amps. Smaller value fuses are fine as long as the radio will work without blowing them.

Powerpole® Connector Assembly

First, slide two connector housings together to match the configuration of the corresponding connectors on your MFJ-4402. It's easier to do this now rather than after the wired terminals have been inserted in the housings.

You can install the *Powerpole*® connectors on your wires by either soldering or crimping, as long as you make sure you have good, solid connections. Wires smaller than #12 gauge will **not** allow for crimping, and must be soldered to the terminals.

To crimp, first strip the wire, making sure not to damage the wire strands. Insert the wire into the terminal and crimp. **Be careful not to deform or squash the terminal body.** If you do, crimp again to return it to its original shape. Otherwise, the terminal may not fit inside the housing. Be sure that you have a good firm connection to reduce resistance.

If you solder wires to the terminals, tin them lightly first. When soldering, flow solder only into the hole in which the wire is inserted. Be careful not to get any solder around the outer body of the terminal.

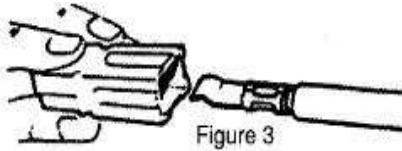


Figure 3

Then insert the flanged end of



Figure 4

Fig 3: Correct orientation of terminal and housing.

Fig 4: Using an insertion tool to snap terminal in place. A very small, flat-blade screwdriver will work.



Fig. 5 (Cut Away)

Fig 5: Assembled terminal and housing.

the terminal into the contact housing through the open, square end of the housing (Figs. 3, 4 and 5). The terminal will snap into place when correctly oriented.



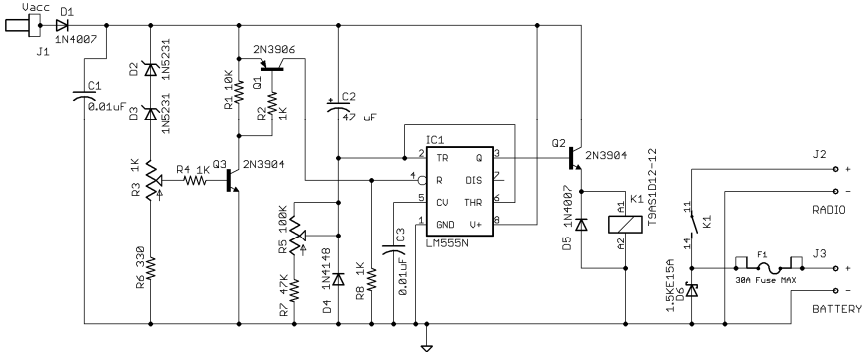
Internal view of two *Powerpoles*® connected.
(Anderson Power drawings; www.andersonpower.com)

ADDITIONAL MATERIALS THAT MAY BE NEEDED

These are materials that may be needed in the installation depending on how the radio is installed and what sort of connections need to be made to the vehicle. In a new install or an existing install the radio's power cable supplied with the radio may have a number of the items listed.

Quantity	Item	Notes
	Red Stranded Wire #12 gauge minimum	Larger wire can be used but may not fit the terminals properly
	Black Stranded Wire #12 gauge minimum	Larger wire can be used but may not fit the terminals properly
	Wire Ties	
	Electrical Tape	
	Terminal to fit Accessory connection	If used
	Fuse tap	If used, must fit the fuse in the panel
	Terminal to fit fuse tap	If fuse tap is used.
	Stranded Wire #16 or #18 gauge for Ignition Sense Line	
2	Battery Terminal Adapters	If needed to fit the battery in the vehicle.
2	Fuse Holders	To connect between the battery and the power cables to the MFJ-4402

SCHEMATIC



TROUBLESHOOTING

<p>Fuse Blows in MFJ-4402</p>	<p>Short in line to the radio.</p> <p>Radio drawing too much current.</p> <p>Multiple Radios drawing too much current.</p> <p>Ovoltage surge</p>	<p>Fix shorted wires</p> <p>Fix Radio</p> <p>Use only one radio at a time in transmit to keep total current below fuse rating.</p> <p>Have the electrical system in the car checked out to identify and fix the cause.</p>
<p>Positive Fuse blows in the line at the battery</p>	<p>Short in the line to the MFJ-4402</p>	<p>Find and repair short in cable</p>
<p>Negative Fuse blows in line to battery</p>	<p>Battery ground loose or inadequate.</p>	<p>Repair ground in the vehicle.</p>
<p>Delay time too short or long</p>	<p>Adjust the time delay control on the MFJ-4402</p>	
<p>Cutout voltage wrong</p>	<p>Adjust the LV SET control.</p>	<p>See the radio owners manual for the minimum level recommended.</p>
<p>Radio still loses memory</p>	<p>Check radio memory battery if one to make sure it is still good.</p> <p>Radio requires voltage to keep memory.</p> <p>Radio may have internal problems in the control circuits.</p>	<p>Battery life is normally 5 to 10 years.</p> <p>Some older radios have a separate line to hold up memory that may need to be connected.</p> <p>Check out the radio to insure proper operation.</p>

<p>Alternator Whine</p>	<p>The MFJ-4402 does not fix alternator whine.</p>	<p>Have the alternator checked out. A blown diode in the alternator may not inhibit its function but will increase whine. Check battery and alternator connections for corrosion and loose connections. Add an alternator whine filter capable of 30A capacity.</p>
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NOTES

FULL 12-MONTH WARRANTY

MFJ Enterprises, Inc. warrants to the original owner of this product, if manufactured by MFJ Enterprises, Inc. and purchased from an authorized dealer or directly from MFJ Enterprises, Inc. to be free from defects in material and workmanship for a period of 12 months from date of purchase provided the following terms of this warranty are satisfied.

1. The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original or machine reproduction of such proof of purchase to MFJ Enterprises, Inc. at the time of warranty service. MFJ Enterprises, Inc. shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, of forgery shall be cause to void any and all warranty terms immediately.
2. MFJ Enterprises, Inc. agrees to repair or replace at MFJ's option without charge to the original owner any defective product provided the product is returned postage prepaid to MFJ Enterprises, Inc. with a personal check, cashiers check, or money order for **\$12.00** covering postage and handling.
3. MFJ Enterprises, Inc. will supply replacement parts free of charge for any MFJ product under warranty upon request. A dated proof of purchase and a **\$8.00** personal check, cashiers check, or money order must be provided to cover postage and handling.
4. This warranty is **NOT** void for owners who attempt to repair defective units. Technical consultation is available by calling (662) 323-5869.
5. This warranty does not apply to kits sold by or manufactured by MFJ Enterprises, Inc.
6. Wired and tested PC board products are covered by this warranty provided **only the wired and tested PC board product is returned**. Wired and tested PC boards installed in the owner's cabinet or connected to switches, jacks, or cables, etc. sent to MFJ Enterprises, Inc. will be returned at the owner's expense un-repaired.
7. Under no circumstances is MFJ Enterprises, Inc. liable for consequential damages to person or property by the use of any MFJ products.
8. **Out-of-Warranty Service:** MFJ Enterprises, Inc. will repair any out-of-warranty product provided the unit is shipped prepaid. All repaired units will be shipped COD to the owner. Repair charges will be added to the COD fee unless other arrangements are made.
9. This warranty is given in lieu of any other warranty expressed or implied.
10. MFJ Enterprises, Inc. reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.
11. All MFJ products to be serviced in-warranty or out-of-warranty should be addressed to **MFJ Enterprises, Inc., 300 Industrial Park Rd, Starkville, Mississippi 39759, USA** and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase and a telephone number.
12. This warranty gives you specific rights, and you may also have other rights, which vary from state to state.



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