Remote Control Systems

INSTALLATION KITS

PCM RADIO CONTROL

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RCS # TEN-LOCv2.

DIY INSTALLATION KIT FOR ONBOARD USE.

BATTERY R/C INSTALATION KIT FOR TENDER LOCOS SUCH AS THE BACHMANN SPECTRUM 2-8-0 CONSOLIDATION, 4-4-0, 2-6-0 AND THE BIG HAULER SERIES.

It can be used with any brand of R/C equipment. Naturally it refers mostly to RCS products.

The instructions for using the RCS TX handpiece are included with the TX. These instructions refer specifically to the Bachmann 2-8-0 “Connie”. The basic principles remain the same so they can easily be adapted to suit other tender locos.

CONTENTS

The **RCS # TEN-LOC** kit contains the following components:
1 x PCB mounted DPDT switch with screw terminals.
1 x pre-wired 2.5/5mm DC Co-ax jack for **CHARGER/AUX-BAT.**
1 x Red/Black 2 x way connector assembly for **Ten**der-**Loc**o connection.
NOT SUPPLIED BUT RECOMMENDED.
1 x **# Y-CABLE** 2 way connector for putting twin stick Ni-Cad batteries in series.
1 x **# RF-CHK** pcb if using with Elsema based R/C to suppress motor “Noise”.

COMPONENTS NOT SUPPLIED THAT YOU WILL NEED.

Level # 1 installation does not require lighting outputs.
An RCS R/C throttle system. **# PRO-3** is ideal up to 7.2 18 volts nominal - 24 volts maximum.
For really big tender locos the **# PRO-6** may be required.

If installing Sierra® sound you will need our **SSI-12v5**
For level # 3 installation you will also need the RCS # **RELAY-1.**
If you choose to use regular SubC NiCd batteries, the # **Y-CABLE** is useful for putting 2 x 7.2 volt twin stick Ni-Cad batteries with TAMIYA connectors in series to get 14.4 volts.

TOOLS REQUIRED.

Medium, small and very small size Phillips head screwdrivers, side cutters and small pliers.
A medium round file to relieve loco body motor slot for motor leads if using the Level # 2 and Level # 3 installation.
A fine tipped soldering iron, resin core solder plus some heat shrink tubing for insulation.
Hot glue and Silicone adhesive for securing components where necessary.

SUITABLE BATTERIES.

Although “AA” size NiMh batteries are very popular they do have some disadvantages.
We suggest you only use them if the current draw is going to be well BELOW 1 amp continuous.
Other sizes of NiMh batteries such as sub “C” will permit very high current draw.
In ideal situations expect up to 500 re-charges. Your must use a NiMh specific charger.
Over charging and too much current draw will shorten that life span drastically.

Our Number # 1 choice is for NiCd batteries. 2 x 7.2 volt twin stick sub “C” packs are ideal.
They will last twice as long. Up to 1,000 charges. “AA” NiCd cells also have limited current draw.
NiCd cells are very tolerant when being charged. The charge best overnight at the standard rate.

As yet we cannot recommend Li-Ion or Li-Poly chemistry.

INSTRUCTIONS.

Although the Bachmann 2-8-0 “CONNIE” is a particularly smooth running loco and is quite easy to get apart, it was not designed for battery R/C. The DCC instructions are not much use so we suggest you simply ignore them as the following will offer a straightforward way of installing RCS.

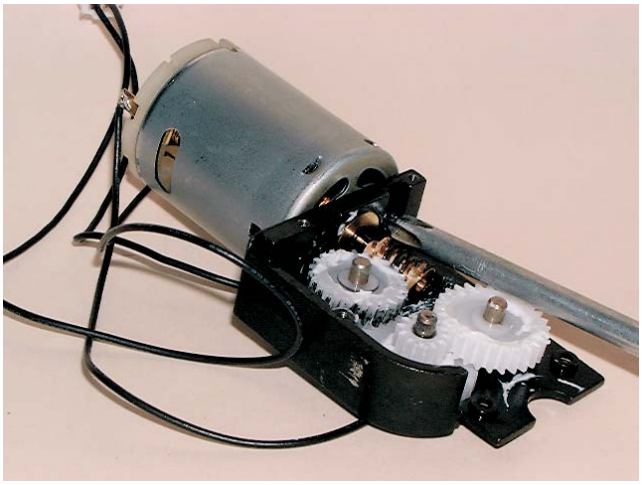
These instructions offer three levels of complexity in wiring.
#1. The most basic. Very simple wiring changes are made in the tender. The only wiring change needed in the loco is to remove the track pick up plug (marked **CON 7**) in the firebox. This level offers exactly the same performance as on track power. i.e. the lights will come on directionally when the loco starts to move. The smoke unit will probably only work correctly at fairly high speed.
There will be no visual indication of programming changes.

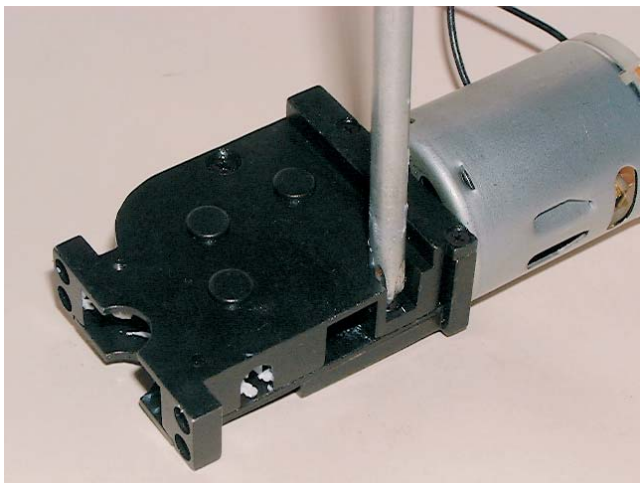
#2. Straightforward with some simple loco wiring changes. This level will permit constant brightness lights and use the RCS reverse light function to illuminate the reversing light when appropriate. The front light will stay on all the time. The smoke unit (if used) will provide copious amounts of smoke but flatten the batteries quite quickly.
Visual indication of any programming changes will be by the rear light flashing.

#3. This level uses a small relay to reverse the internal Bachmann wiring to permit constant reversing lights and full smoke. The front light will extinguish when rear light is on.
Visual indication of programming changes will be by the front & rear lights flashing alternately.

GETTING STARTED

Even if you opt for version #1 wiring we still recommend you make sure the screws securing the motor to the gearbox and the gearbox screws themselves are tight. Our sample, and many others have had them loose.
If you are sure the screws are tight you can skip the next step.
First lay the loco on its left side and carefully remove the very small shouldered screw that holds the Johnson bar rod to the valve gear. Store it carefully as it is not replaceable.
Now support loco upside down in packaging material and remove the 4 small screws that hold the ashpan cover on. Again store them carefully. Lift off ashpan cover and remove the four big screws that hold the chassis to the superstructure.
Remove the long screw under cylinder saddle at the front and the superstructure will separate from the chassis. Be careful that the piping is not bent as you proceed.
The two pictures below show what to check for in the gearbox.

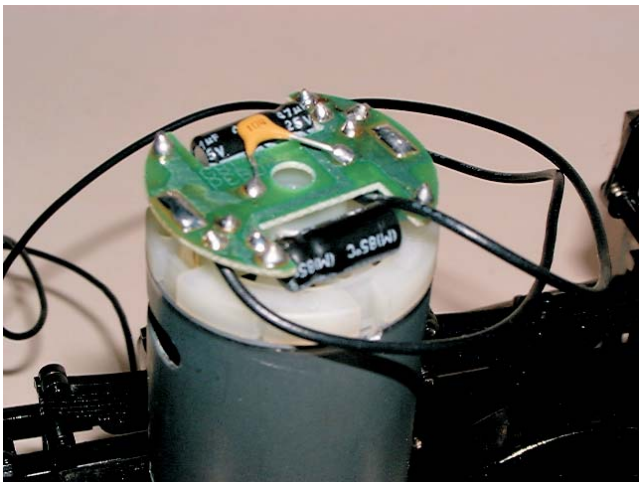


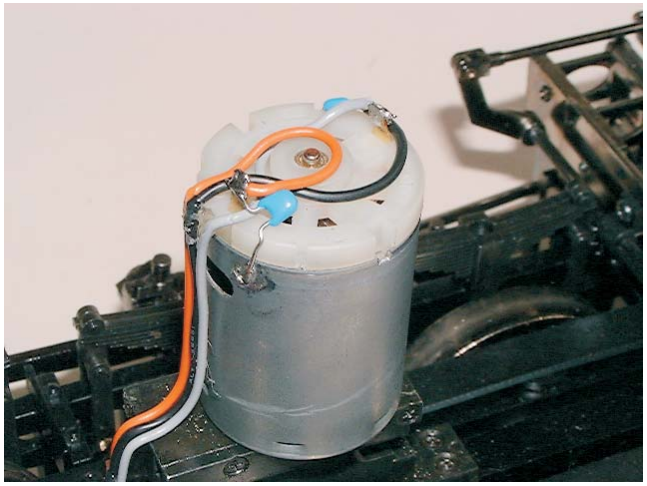


Remove the four screws that hold the gearbox plate on and set the parts aside.
Remove and clean each screw. Apply Loctite® to each thread before replacing them. You can also use a clear nail polish varnish.
Now is the time to decide if you wish to cut all the tracks on the long chassis pcb. Doing so will possibly improve range. Call RCS for advice on how to remove, modify & replace the long pcb.
Replace the gearbox and make sure the four screws that hold the bottom gearbox plate on are tight. Do not overtighten screws when replacing them.

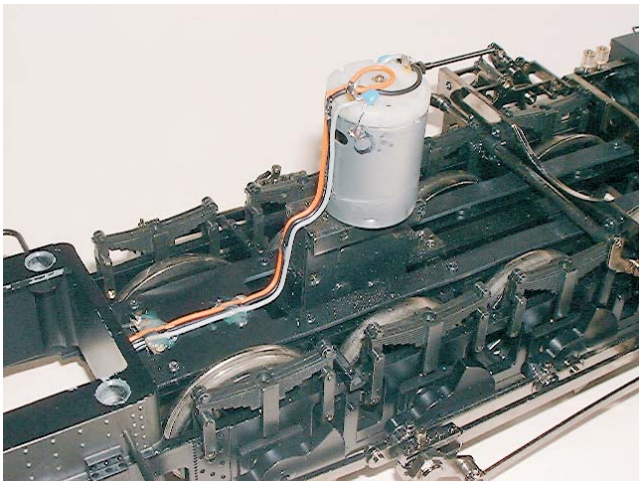
MOTOR SUPPRESSION

To enable reliable operation of onboard R/C, electric motors need to be adequately suppressed. Bachmann have mounted a small PCB on the end of the motor that contains a suppression circuit. The PCB contains quite high value capacitors that will cause the **RCS ESC** to overheat. We recommend that you remove this PCB.
Although the picture shows it there is no need to add any suppression to the motor. 2.4 Ghz R/C is impervious to RFI.
If you are going with a level #1 installation reconnect the Bachmann wires to the motor.



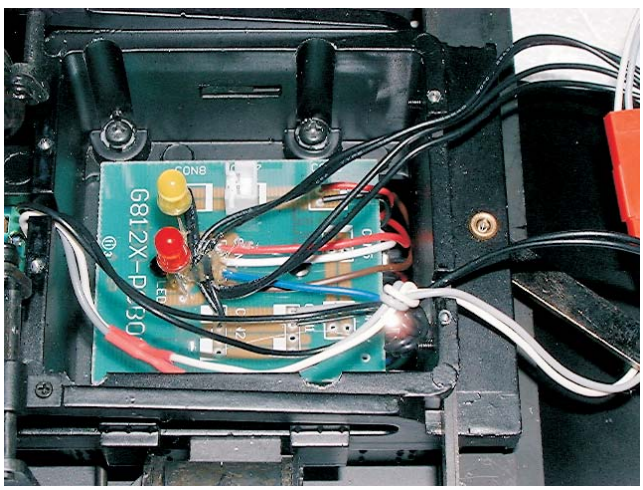


If you are opting for a level #2 or #3 installation remove the wires from the motor and disconnect the in-line plug located in the boiler & discard them. Now feed the supplied Red/Black Tender-Loco harness wires with the smaller “winged” plug into the rear of the loco & then along the top of the chassis up to the motor. Solder the wires to the motor. Black to the front. No motor “Noise” suppression is needed. Ignore caps shown Locate & secure the cable with small dabs of hot

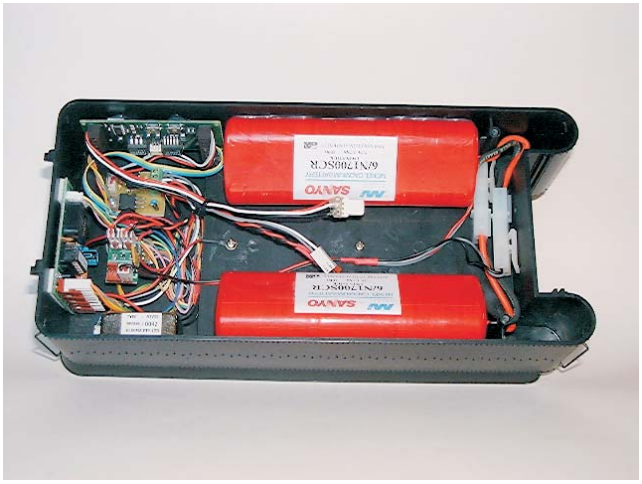


Cut a notch in the underside of the boiler where the motor fits to allow enough room for the cable to clear.
To enable easier refitting of the boiler use a countersinking tool to chamfer the edges of the four firebox mounting holes in the metal casting. This can be seen at left where the tops of the holes are shiny.
Be very careful reassembling the loco to make sure the various pipes on the boiler fit in the correct spaces.
Replace the body to chassis mounting screws. 4 x Firebox & 1 cylinder saddle.
Replace the shouldered Johnson bar screw.

Before replacing the firebox tray remove the little plug (**CON 7**) on the firebox PCB that comes from the loco track pick ups. This isolates the loco from the track.
The supplied 2 way Red/Black harness (shown White/Grey) is knotted to stop it being pulled through accidentally. Also knot the 2 x way and 4 x way Bachmann cable and locate in the slots provided.
Now replace the firebox cover and the loco wiring is complete.

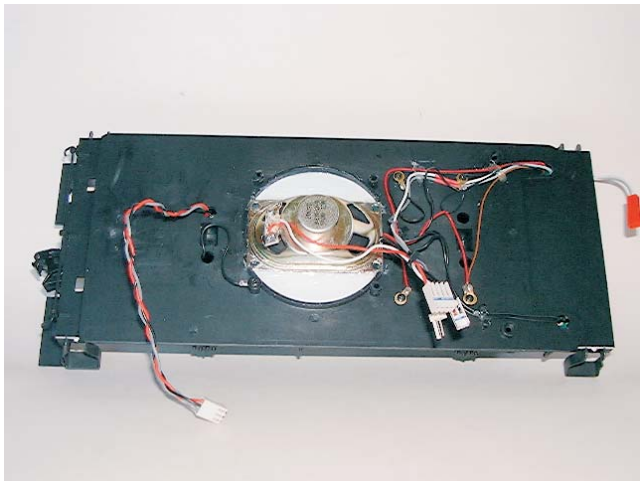


INSTALLING BATTERIES.



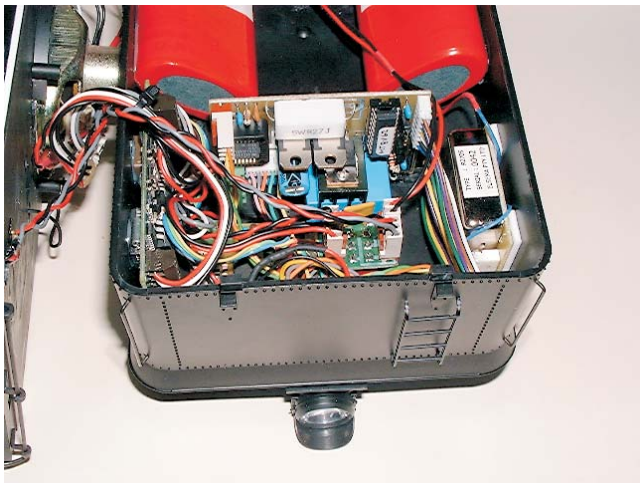
The least expensive type of battery packs to use are 2 x 7.2 twin stick Sub “C” NiCad cells. These are fitted with Tamiya plugs. Because the Bachmann 2-8-0 tender shell is shallower than the 4-6-0 these packs will need to be canted over to fit.
We secured them with a silicone adhesive. This will limit the size of the speaker magnet you can use.
2 x “AA” 7.2 volt packs made up in twin stick shape are an alternate choice as they will fit along the tender shell sides. Bear in mind current over ½ amp will shorten battery life.

We chose a # 664 2 watt 8 ohm oval speaker available from Dallee which we glued to the floor & sealed with styrene shapes we cut to fit the speaker grille. This has proven to give adequate volume and clarity with the Sierra sound we fitted. Although not necessary, we fitted in line plugs and sockets between the shell mounted components and the tender floor to facilitate constant removal of the tender shell required whilst writing these instructions. The Tamiya type plug connectors tuck down in the front.



WORKING ON THE TENDER SHELL.

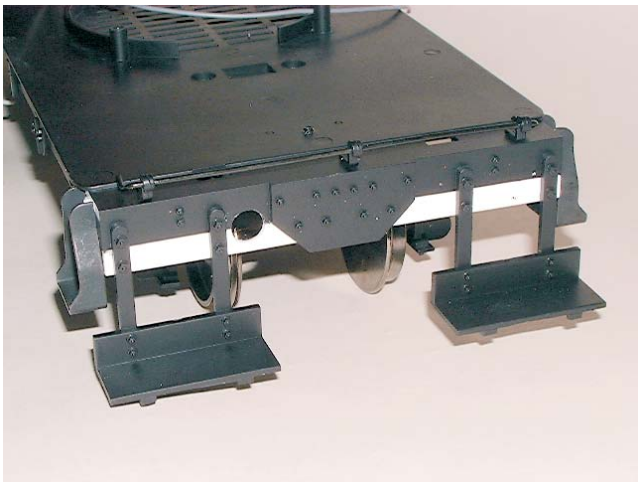
The ON-OFF switch assembly is mounted under the water hatch on the tender shell along with the Sierra volume control. The optional # **DIP-SW** shown is not required.

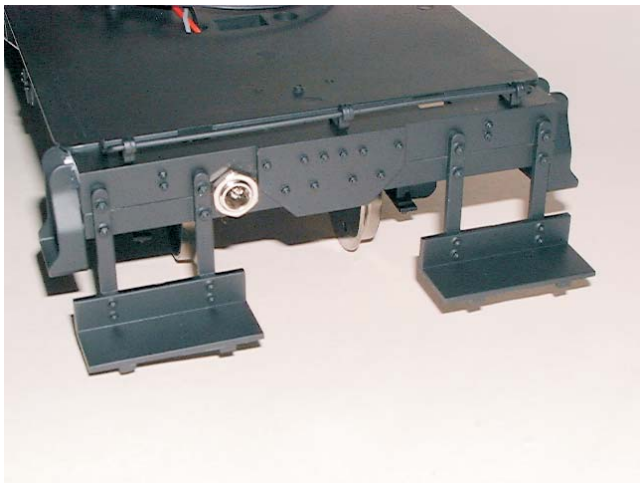


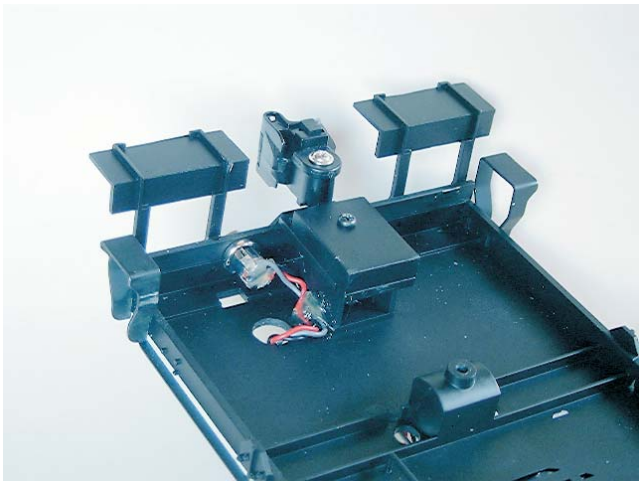
Placement of the older **RCS ESC** system components is shown in the picture above right. Newer systems are smaller allowing different placement. Use a silicone adhesive to secure the parts.
No special provision for antenna placement is necessary with 2.4 Ghz R/C. The receiver antenna wire can be simply left as it comes.

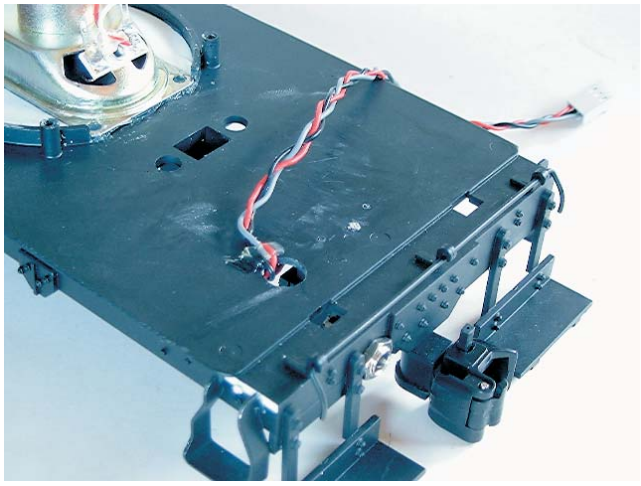
WORKING ON THE TENDER FLOOR.

Although it is quite simple to mount the charge jack in the rear of the tender shell we chose to mount it in the rear cross beam. To do so you will need to make the beam deeper by adding some styrene strips to the existing beam. See the picture below left. Once the cement has set drill a pilot hole for the charge jack and ream the hole out to fit.
We painted the beam in a flat black that matched the Bachmann® colour.
Drill a hole through the floor so that the three wires for the charge jack harness can pass through and mount the jack in the end beam.









WIRING THE VARIOUS COMPONENTS.

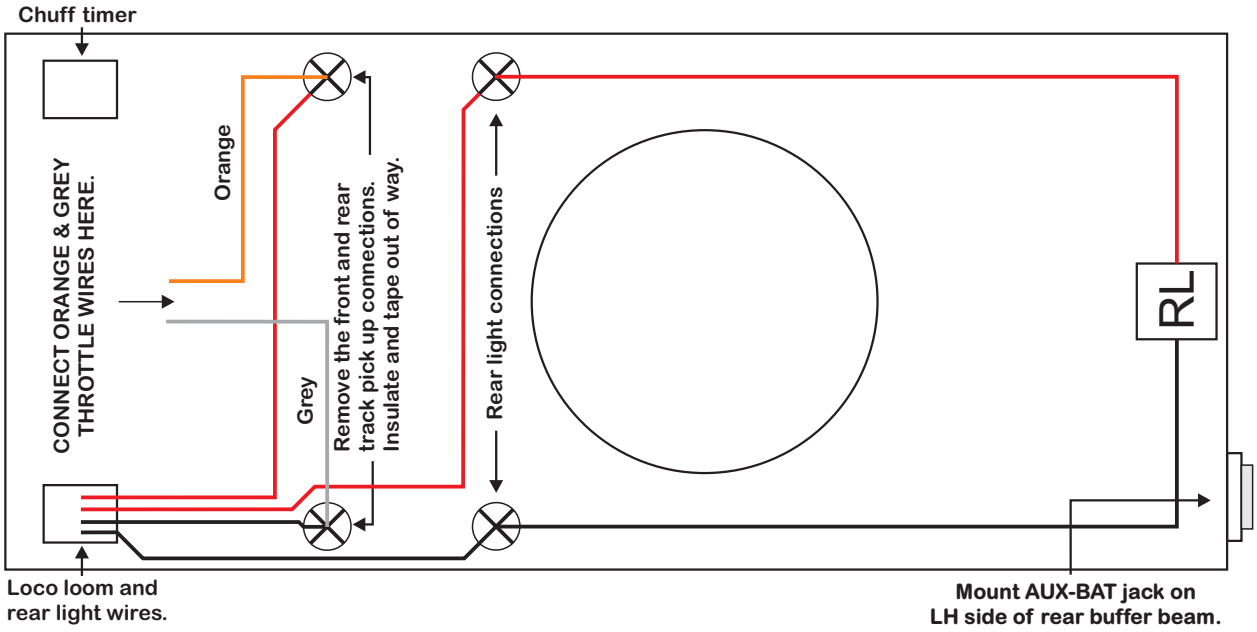
It is now time to connect the various wires. The previous pictures will give you a general idea of where the various parts can be located. The general wiring arrangements are shown in diagram form on the next pages. Refer to the instructions that came with the RCS R/C throttle.
Take your time and make sure that any solder joints you make are insulated with heatshrink tubing. Where possible keep the various wires loomed together with small cable ties.
If you elected for level #3 installation wire in the **# RELAY** pcb as per the diagram on page # 7.
SIERRA sound requires the fitting of an **RCS # SSI-12v5** interface.
Once you have the wires connected make sure the ON-OFF switch is set to off. Then plug in the system components. Leave the batteries to last.

TESTING THE LOCO (LEVEL #2 or #3).

Couple the tender to the loco with all cables connected between the loco and tender.
Turn on the ON-OFF switch and if lights are fitted one or the other will come on indicating there is power in the system and the microprocessor is functioning correctly. Press the direction change button and if the lights respond your are ready to start testing the locomotive.
For operating instructions please consult the TX handpiece instructions and read them in conjunction with these instructions.

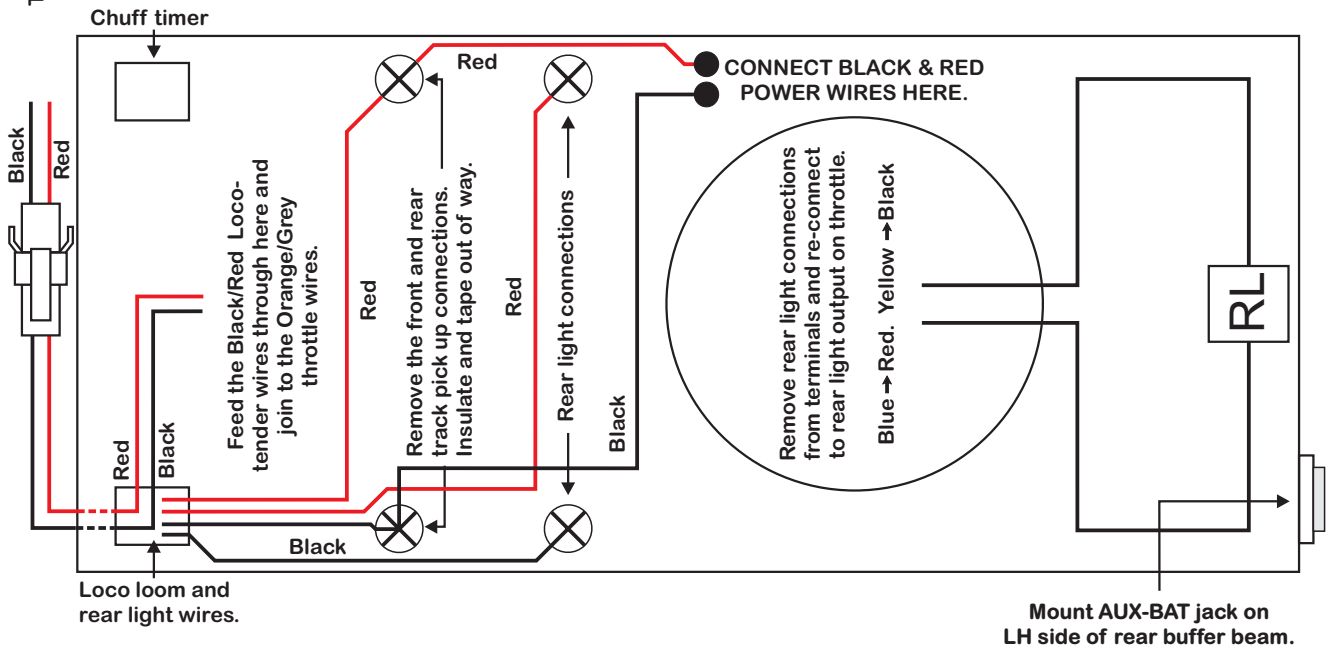
LEVEL #1 TENDER WIRING

This level of complexity requires no changes to the loco wiring at all.
The lights will be OFF when loco is stationary and will come on in the correct direction when loco is moving. Just like it does on track power.
If you want constant brightness lights see level #2 below.



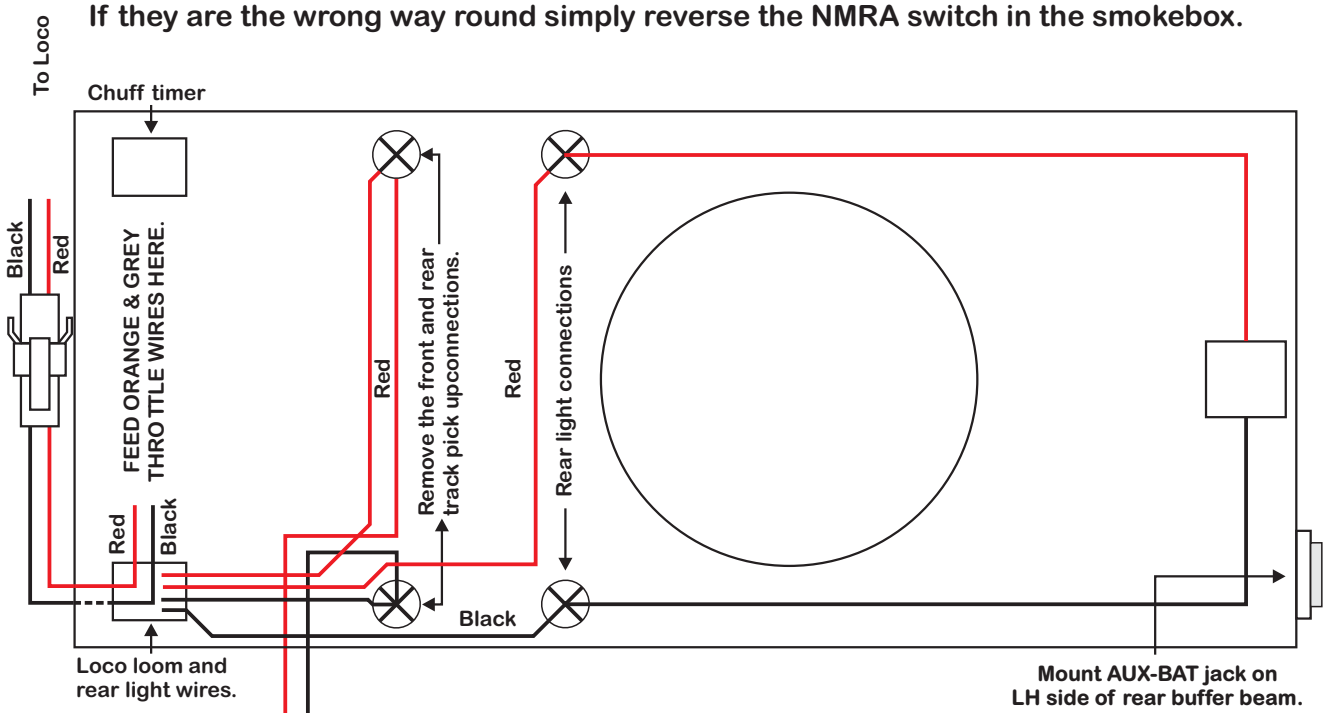
LEVEL #2 TENDER WIRING.

This level of complexity requires some changes to the loco wiring.
The motor wiring in the loco is replaced by a new 2 way connector from the tender.
The traction batteries are connected to the loco wiring loom to provide a constant fixed polarity voltage. The front headlight will be on all of the time.
If you wish the rear light to illuminate in reverse simply connect the tender tail light wires to rear light output on the ESC decoder.
The front headlight will stay on when in reverse direction.
If you require constant brightness fully reversing lights you must use Level #3 wiring or rewire the loco to suit.



LEVEL #3 TENDER WIRING

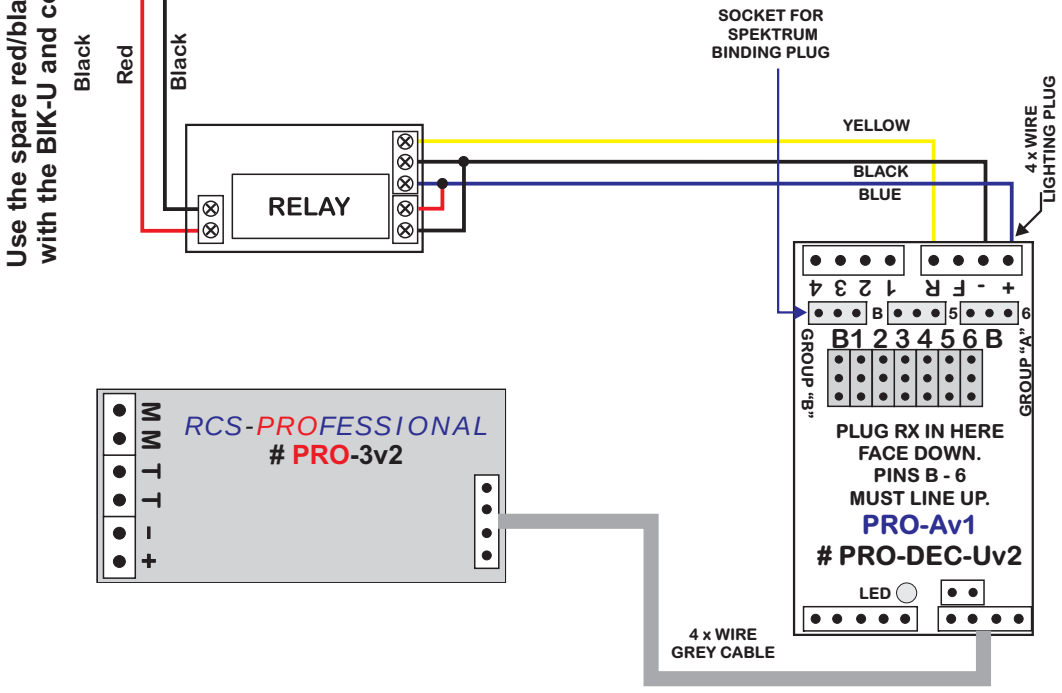
This level of complexity requires some changes to the loco wiring.
The RCS reverse lighting output is used to drive the RCS #RELAY.
The RELAY will polarise traction voltage before it is fed into the loco wiring loom.
One or the other lights will always be ON when loco is stationary. They will automatically change for the correct direction.
If they are the wrong way round simply reverse the NMRA switch in the smokebox.



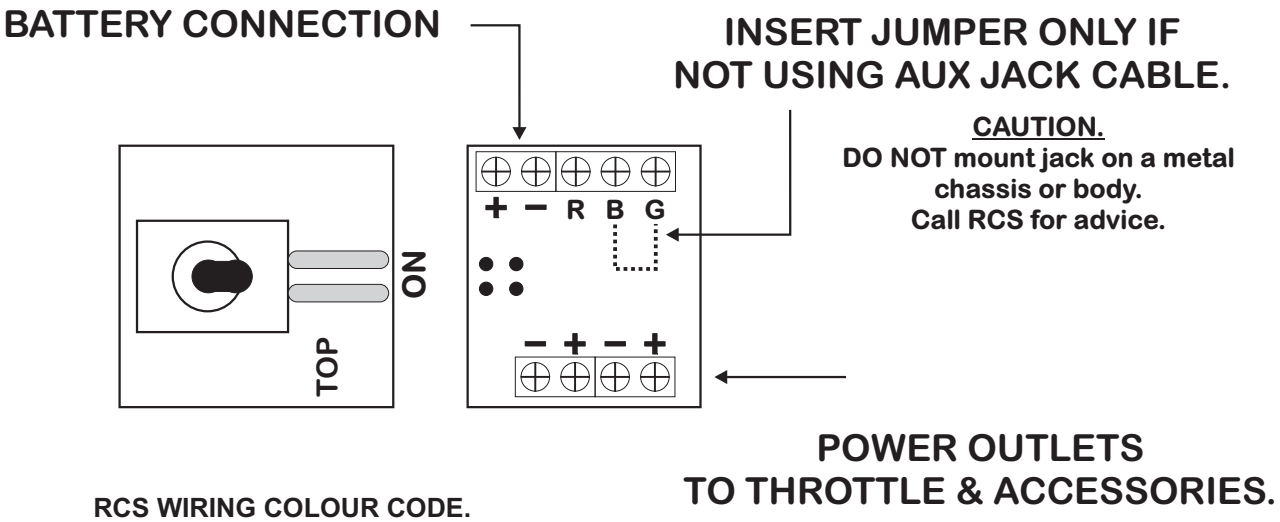
HOW TO WIRE IN THE RCS # RELAY-1 TO CHANGE LOCO WIRING POLARITY.

Connect to traction battery supply at the BIK-U3 switch.

Use the spare red/black cable supplied with the BIK-U and connect as shown.



THE BIK-U3b SWITCH & WIRING.



RCS WIRING COLOUR CODE.

COMMON (- Ground)	=	BLACK
BATTERY VOLTAGE	=	RED
MOTOR +	=	ORANGE
MOTOR -	=	GREY
POLARISED VOLTAGE	=	BLUE
REGULATED 12 V	=	LT BLUE
REGULATED 5 V	=	CREAM
FRONT LIGHT	=	WHITE
REAR LIGHT	=	YELLOW
F1 (WHISTLE/HORN)	=	GREEN
F2 (BELL)	=	VIOLET
F3 (SPARE)	=	BROWN
F4(SPARE)	=	GREY

TYPICAL INSTALLATION WITH # AUX-BAT

PAY PARTICULAR ATTENTION TO THE JACK WIRING.
IF NOT WIRED CORRECTLY IT IS POSSIBLE TO SHORT OUT THE BATTERY.