

TSL CLASSICS - WIRING OPTIONS

1. Introduction

This brief overview of competition vehicle wiring attempts to set out the various options available when rewiring and upgrading the electrical system of a classic rally car. Within these five options there are many other alternatives available which will have impact on both cost and reliability. However it is an attempt to give a clear picture of what is available and some of the pitfalls of dealing with automotive electrical components designed in an age when reliability was much less of a priority than it is today. It is still true that electrical problems are the biggest cause of DNF's.

2. Overview

In general the wire used to connect the items within a car is very reliable. It is usually the terminations of the wire ends and the units connected to the terminations that cause reliability troubles. Electrical connection failure is almost always caused by the ingress of water molecules leaching in over time, between the strands of the wire and the terminal. The water molecules set up a single cell inside the termination leading to corrosion and eventual high resistance joint causing loss of operation. The stamped and folded type of termination used in the automotive industry is impossible to make water molecule ingress proof but options are available to greatly reduce the rate of corrosion growth allowing many years of trouble free service in the most demanding locations.

It is usually impossible to avoid the use of spade connectors or even worse screw terminal connections somewhere in a classic rally car. However there are many things that can be done to improve the reliability of this connection type from the choice of terminal quality level to the addition of environmental protection.

It is possible to use later more modern components from other cars and non automotive switchgear to improve reliability but this may not be acceptable either from an aesthetic or eligibility requirement.

Items such as lamp clusters cannot easily be replaced with new production units but they can be rewired with new or refurbished lamp holders to improve reliability. Original switchgear can be refurbished and with the addition of relay switching will give many years of additional service.

Wherever possible multi way connectors should be used to connect units and wiring loom sections. This gives the option of easy removal for servicing. The reliability of modern environmentally sealed connectors is excellent and the cost impact small.

The addition of a new multi fuse fuse box and relay switching of all high current circuits should be thought of as mandatory with the option of the fuse box being placed inside the crew compartment. The fuses should be of the blade type and a similar allocation to that of a modern car is desirable. Some or all of the fuses may be replaced with circuit breakers if desired.

The FIA red key type of battery master switch switch is notoriously unreliable and one is looking at when, not if, a failure will occur, usually of the ignition circuit. The preferred alternative is to use one of the electronic battery master switches with the additional benefit of keeping heavy current wiring and terminations to a minimum in the crew compartment.

The documentation to be supplied on paper and CD format will include.

- Circuit diagram.
- Connector pin allocation.
- Component physical location diagram.
- Parts list giving component ratings and suppliers where appropriate.

3. Options

The following options are brief overviews available in the manufacture of a new electrical system listed in order of cost.

Option 1

Fit new loom manufactured to original design with a supplementary loom for additional functions. Original loom will have standard automotive quality wiring and terminations.

Supplementary loom can be to higher quality standards and will be of custom design. Starter motor and engine bonding cables will be manufactured from extra flexible copper cables with Hypalon insulation (this is applicable to all later options).

Advantage

- a) Lowest cost option.
- b) Quick installation.

Disadvantage

- a) Limited to use of original style fuse box in original location.
- b) Conductors may be of smaller gauge than is desirable for modern lighting.
- c) Difficult to add relay switching for pre existing functions.

Option 2

Design and manufacture a new custom loom in Tri Rated PVC wires having an operating temperature of 105°C in hot oil. Loom to be wrapped in non adhesive PVC loom tape. Loom to be modular with connectors between sections.

All connections to removable items e.g. light units to be via multi way connectors avoiding use of blade and bullet connections as much as possible.

Connectors to be multi pin environmentally sealed current production items by AMP.

Advantage

- a) Custom design so no constraints on conductor size fuse or relay placement or functions.

Disadvantage

- a) Increase in cost mainly due to manufacturing time.
- b) Use of wires with higher specification PVC insulation tends to produce larger diameter main cable runs. However this does not produce a large weight penalty as the copper conductors dominate.

Option 3

Loom design as option 2 but wire to be high performance automotive wire manufactured by Raychem. This wire has a thinner lighter and higher hot oil temperature rating than PVC thus producing smaller diameter looms. However it is produced in a very limited number of colours which requires the use of numbered/colour coded sleeves on wire end for identification. This does add significantly to loom production costs.

Loom to be covered in high performance sleeve

Option 4

Loom design as option 2 but wire will be single colour Raychem 44 or 55 airframe wires. This is a light weight very tough dual wall insulation that is designed to run over the sharp edges of aircraft structures without additional protection. It has outstanding performance characteristics and is used by all F1 and WRC teams. Being single colour numbered sleeves are required on wire ends. Connectors to be AMP as in option 2.

Loom covered in compatible halogen free sleeve

Option 5

As option 4 but the connectors replaced by bayonet lock military specification items. The increase in cost is not justified by the small increase in reliability as many of the original design electrical items cannot be modified to accept new connector types and therefore the reliability of these old design units will dominate over any small increase generated by the new connectors