

## RESEARCH PROJECT SUBJECT TITLE: Moped Restoration

**RESEARCH TOPIC: Rebuild a Yamaha QT50, only using genuine parts if no other parts are available.**

### ASSESSMENT TYPE 1: FOLIO

Annotated assessment comments (yellow) are included throughout this work sample and an assessment decision, based on the performance standards, can be found at the end of this document.

As stated in the *Stage 2 Research Project Guidelines 2011*, a maximum of ten A4 single sided pages of material can be included in the student portfolio submitted for moderation of this part of Assessment Type 1: Folio. The teacher and student select evidence that may include materials from the proposal. Evidence of the discussion part of the folio is in addition to the 10 pages and may be 2 pages or 10 minutes of evidence.

To illustrate\* the selection of materials for moderation, selected pages have been identified. Those not being sent to moderation have been recoloured grey.

The role of moderation at Stage 2 is to confirm the school's assessment decisions, and it does not involve remarking student work. For Assessment Type 1: Folio, final moderation involves the review of the selected evidence to confirm that the application of A+ to E- assessment grade levels is consistent with the performance standards.

Considerations in selecting evidence for Assessment Type 1: Folio

- Creating little to no re-formatting or editing of original evidence to minimize teacher/student workload and to value the inclusion of authentic evidence
- Including evidence, where practicable, from each of the specific features of the Planning and Application assessment design criteria (i.e. specific feature P1, P2, A1, A2 & A3)

\* Note: This is an illustrative selection and should not be viewed as the only, or best, possible selection from the evidence available. For example, a case could be mounted for the inclusion of the Bibliography in the pages selected.

# Assessment Type 1: Folio

## PART A: PROPOSAL Broad Area of Research: How to rebuild a moped?

### Background to choice:

I have a real interest in mechanics and have done so since I was a kid. I grew up taking things apart and putting them back together again. Luckily, we have a really large workshop at our place and a lot of tools, as my father and brother are also keen on working with cars. I started an apprenticeship in electrical engineering but have returned to school as I would really like to complete my SACE and have the option to go on to tertiary study. I'm not sure if I want to just rebuild things as a hobby or if I would like it to be my future career and own my own business, or if I want to go to university and study engineering there. When I heard about the Research Project at the end of last year I got the idea of restoring a moped. I had been thinking about doing for a long time as I wanted a cheap environmentally friendly set of wheels. During the holidays, after doing some research on the internet, I decided on the model to buy based on availability and cost. Six days after putting an online advertisement I got a call and was able to buy a vintage Yamaha QT50 moped for \$50! PERFECT! This led me to a:

**Refined topic:** Rebuild a Yamaha QT50 to vintage specifications

### Planned research processes:

a) Web-based research:

- Information about different types of bikes – to inform my decision on what sort to buy
- eBay – for bike, parts, components
- online stores – for parts, components
- YouTube- advice from experts re various stages of the re-build
- Online Forums – solutions to problems that may arise
- Transport SA site – for official, legal requirements.

b) Technical Book Based – studying service manual

c) Consultation with Experts – advice on how to do some of the tasks, problem diagnosis, solutions

d) Observation – painting and polishing techniques in a trade workshop

e) Trial and Error

f) Testing of Parts

g) Interview/s – with expert (have already asked WH – vehicle restorer)

Ethical Issues:

- need to find out about safe work practices for the mechanical tasks
- environmental issues – observe safe practice when disposing of chemical wastes from engine, cleaning agents, painting
- provide information about the project to people I wish to work with and obtain their permission.

### Capability

I have chosen *work* as the most relevant capability. My reasons for this are that I will be developing employability skills relevant to the work place e.g.:

- Time management
- Responsibility
- Specific mechanical skills, e.g. painting, polishing, sanding, measuring
- Working independently and with others
- Learning about responsible participation in work – finding out about environmental issues and OHSW practices
- Problem solving.

I also hope that by undertaking this research project will help me make up my mind about my future career, (e.g. setting up my own business specialising in restoring vintage bikes) or whether I should try to go on to University.

### Research Outcome

A restored moped and a written report explaining how the research drove the decisions to restore it in the way I did.

#### Planning

Topic is highly refined, e.g. down to the model and make and type of specifications.

#### Planning

Very thorough level of planning of activities that are extremely suited to the purpose are identified here, and ethical considerations are mentioned.

## Part B: Research Development

### 1.0 Sourcing Vehicle (this was completed in the holidays)

I am interested in rebuilding some sort of bike/moped, but don't want to have to get a special drivers licence.

Task: Investigate Legal requirements for riding a moped, (e.g. licence) at TransportSA website.

Here is what they said!

#### **Riding a moped**

The holder of any class of South Australian driver's licence can ride a moped as long as the moped is registered, insured and compliant with Australian design rules.

The holder of a learner's permit cannot ride a moped unless the permit is for R-DATE or R-class.

#### **What is a moped?**

A moped is defined as a two or three-wheeled motor vehicle (other than a power-assisted bicycle) that:

is propelled by an internal combustion engine with a capacity not exceeding 50 millilitres; or a motor other than an internal combustion engine, and

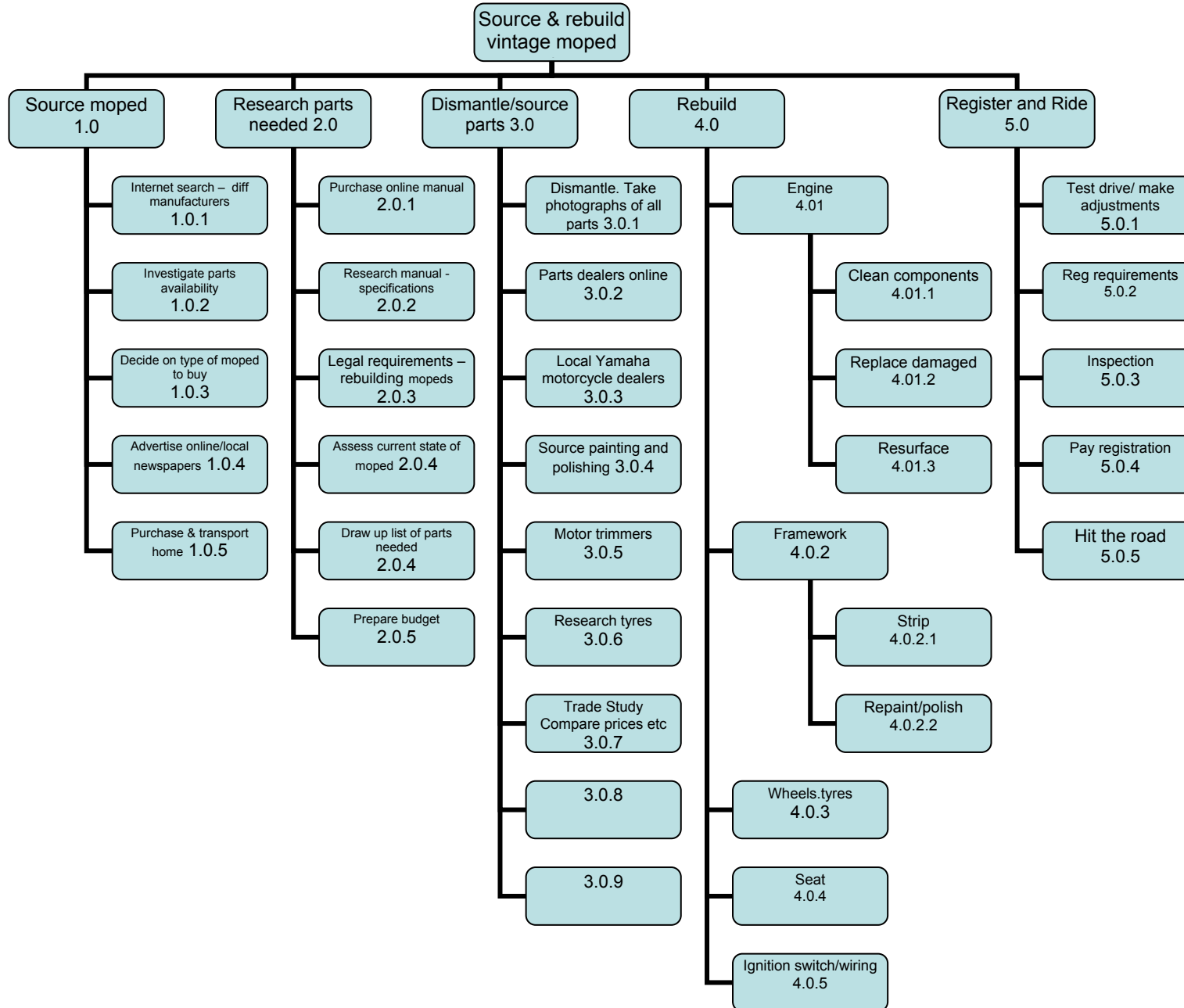
is capable of a speed not exceeding 50 kilometres per hour.

<http://www.sa.gov.au/subject/Transport,+travel+and+motoring/Motoring/Motorcycling/Motorcycles/Riding+a+moped>

THIS IS PERFECT FOR ME!

Task : Will brainstorm all aspects of my topic. Work Breakdown Structure would be helpful.

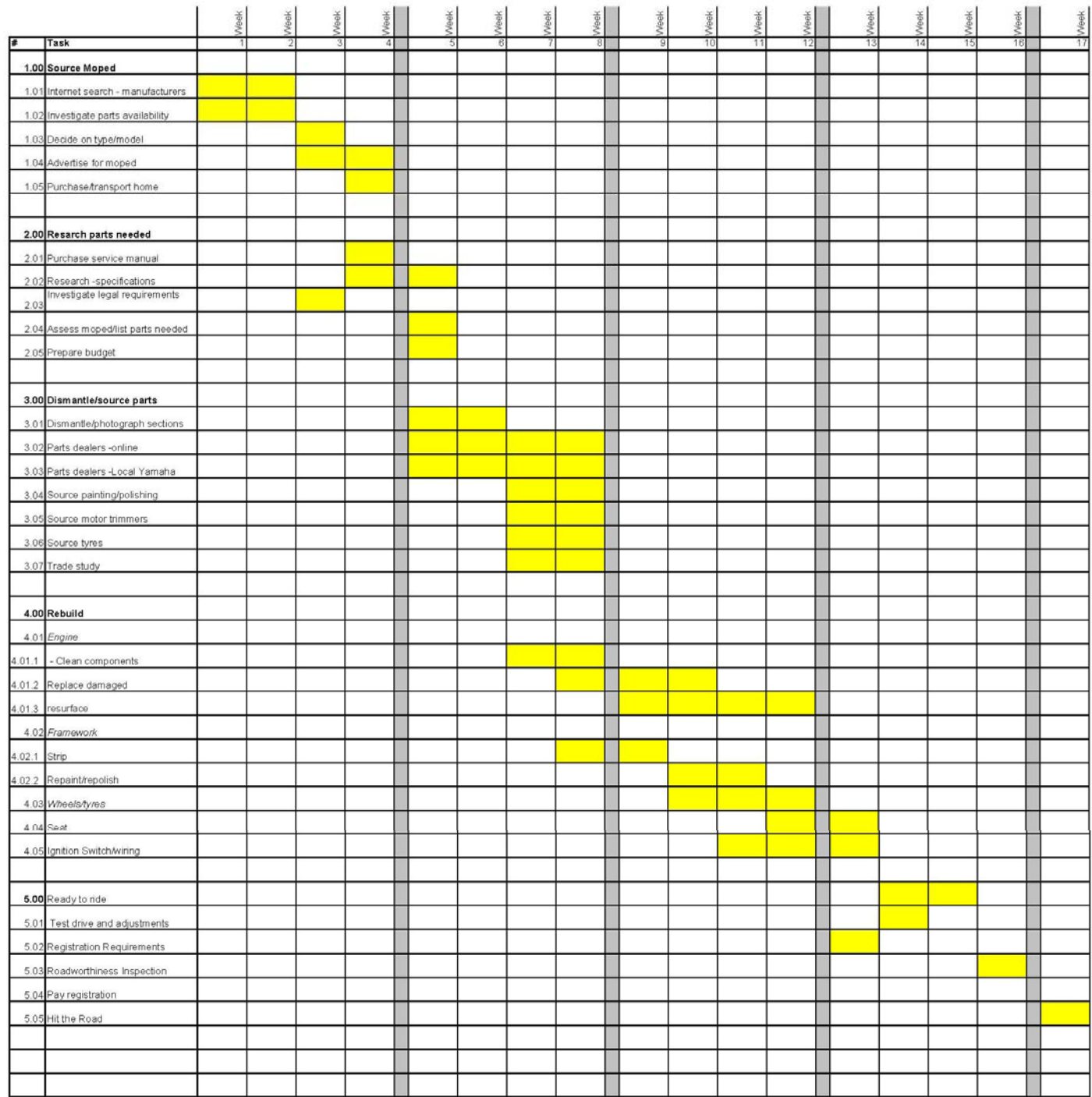
# WORK BREAKDOWN STRUCTURE



The following Work Breakdown Structure provides excellent evidence for a number of specific features:

**Planning**  
 “excellent consideration” of all aspects of the topic – identifies here all the areas to be researched.

“thorough planning” – through identifying such a large range of activities to be undertaken and researched – has thought of everything.



**Planning**  
 Gantt chart shows highly detailed breakdown of planned activities, projected time frame and anticipated sequence.

# 1.0 Sourcing moped

Factors in decision of which type of bike/moped to buy:

- Price of unit ( don't want to spend more than \$200)
- Proximity – needs to be close to Adelaide, so I can inspect, pick up /or delivery costs not too much
- Parts need to be readily available and affordable.

## 1.01 Internet Search of different manufacturers of bikes/mopeds

Research Processes:

- Internet search (Google) on mopeds
- talked to people I know.–Advice - stay clear of vehicles build in China due to poor build quality with metal imperfections which lead to breakages
- cheap-mopeds.com – advised “noped” type as cheapest available on Ebay. Suzuki FA50, Yamaha QT50, Honda Express – because they are big brands (See quote below).

**DEFINITION : Nopeds** - Are a clever combination of moped and scooter. They usually have a minimal chassis design and larger wheels like a moped, with a modern enclosed engine/transmission that moves in unit with the rear suspension like a scooter. Nopeds have no pedals so hills and acceleration can be a problem, but as we're talking about cheap mopeds, they are often the cheapest mopeds available on eBay. The models to look for are the Suzuki FA50, and Yamaha QT50, or the Honda Express and particularly the Honda Urban Express 50's are cool, and comfortable. Their big brands mean parts are easy to get new from the dealers or second hand from a bike wrecker. If cheap mopeds are what you're looking for then nopeds in my experience are the models to go for <http://www.cheap-mopeds.com/>

This looks like the best way to go – these models and parts will fit into my budget and meet my criteria for affordability and parts availability.

### 1.01.1 Research – availability and affordability of Suzuki FA50, Yamaha QT50, Honda Express

- put ad on local website <http://adelaide.gumtree.com.au> for a 1979 Yamaha QT50
- looked at ads on ebay for the ones recommended by cheap-mopeds.com

Honda NC50	Yamaha QT50	Honda Express
1 bikes available	2 bikes available	Very rare
705 parts available internationally	498 parts available internationally	Limited parts available

Discarded Honda Express as too expensive and rare

### 1.0.2 Continue to investigate parts availability to narrow search

WIKIPEDIA re the Yamaha QT50 [http://en.wikipedia.org/wiki/Yamaha\\_QT50](http://en.wikipedia.org/wiki/Yamaha_QT50)



1.0.3  
After assessing all information, Yamaha QT50 seems like the best option.

Its simple, maintenance-free shaft-drive contained in the single-sided swingarm eliminates chain maintenance, safety and wear concerns as well as weather wear factors and contributes to the durability and ease of use of these tiny motorbikes. The drive unit also incorporates a traditional centrifugal clutch but only a single speed gearing, unlike most mopeds which have two speeds. The simplified driveshaft setup makes wheel changes easy.



Most of the parts for the QT50 are still available from Yamaha dealers. New and used parts are often found on eBay as well.

**1.05 Purchase/ transport home**

26/4/10 – Recvd call – purchased Yamaha QT50 for \$50. Body is in poor condition – requiring full restoration. Engine OK, as the motor turns over. Perfect.

TOPIC: REFINEMENT: How to rebuild a 1979 Yamaha QT50 to vintage specifications!

**Planning**  
Further refinement of topic- even has the year of the model – “thorough refinement”.



Moped I purchased.

**2.0 Research Parts Needed (for 1979 Yamaha QT50)**

**2.0.1, 2.0.2, 2.0.3, 2.0.4 Purchase service manual, research specifications, assess moped, list parts needed**

Purchased Yamaha QT50 manual from eBay (cost \$25) – will be guide to removing and re\fitting parts and components:

- after studying service manual and analysing my moped, my first thoughts are that will need the following parts that are broken or need to be replaced:
  - Gasket kit
  - Tyres by 2 sizes 225 14
  - Seat cover
  - Brake light lens
  - Yamaha sticker set
  - Tubes for tyres
  - Handle bar grips
  - Ignition barrel and key set up
  - Battery part no 6n4 2na
  - Brake cables
  - Throttle cables
  - Speedo cables.

Research Process  
–book based research, e.g. studying service manual  
- observation of moped.

**2.0.5 Therefore have made up budget – to see if manageable (within my budget –)**

Item	Estimate in \$	Actual Purchase Price in \$
Moped	150	50
Service and repair manual	20	25
Paint frame	200	250
Tyres	100	83 delivered
Handle bar grips	40	20
Re-chrome components	100	90
Workshop consumables	50	
Spray cans for painting	40	40
Polishing compound	30	20

Engine gaskets	40	27
Stickers	30	65
Re-trim seat	50	50
Cables (new)	200	185
Ignition switch	50	70
Battery	50	32
Tail light lenses	20	20
Tyres/tube removed/fitted		30
Registration	150	92
TOTAL		

### Research - Parts

#### a) Parts available locally

- 29/4 Email to Yamaha Pitmans – no luck, gave me a mobile number to call
- 7/5 Called – no answer (tried again one month later – number disconnected)
- Ring Scooter World – none locally. Suggested online (eBay)

#### b) Research – eBay

c) Research – web-based (Robert Livesay's website <http://www.helium.com/items/507127-how-to-restore-a-motorcycle>)

Research Processes:  
a) Web-based – eBay  
Online stores  
Experts  
b)  
Consultation with local experts

Complete, motorcycle restoration almost always requires a complete disassembly down to the frame, a thorough cleaning, rebuilding or replacement of parts, re-chroming, professional body work and painting. Poor paintwork on motorcycle body parts, especially the tank, can ruin an otherwise outstanding restoration project. It also requires re-lacing of spoke wheels, new seat foam and cover, engine overhaul/rebuild, and electrical system upgrades.

The first step is to haul the motor off to an engine shop that specializes in completely rebuilding your type of motor. Restoration includes not only the parts that can be seen; the frame, trim, chrome, wheels, speedometer and tachometer, but also the engine, brake, cooling, and fluid systems. The three essential ingredients in any bike restoration project are an engine, a frame and a manufacturer's parts book. If your budget doesn't allow for this, go round your area and ask the mechanics at the larger Japanese motorcycle dealers if they know a specialist restoration mechanic in your area.

The nature of motorcycle restoration is that there are always surprises and usually those surprises require more time and work and not less. Even though it requires a lot of time and quite a bit of money.

Rebuilding sequence according to this short but good article:

1. Dismantle
2. Clean
3. Rebuild or replace parts
4. Re-chrome
5. Professional body work and painting ( I hope to do this myself to save money)-

Parts book

Be prepared for surprises!!!

Useful article: outlining areas to complete a restoration on motorcycle. It suggests the need to pay particular attention to professional painting, new seat cover and engine overhaul.

Also how important it is to have a manual. Luckily I had already thought of that from previous experiences.

**Application**  
Analysis of useful information from





Studying the manual to carefully dismantle the moped. Note- wearing safety glasses, covered in shoes and well covered clothes (Service manual suggested this was necessary)

**Application**  
 Highly effective application of skills in dismantling the bike in a methodical manner following advice from manual.



Some pieces of the moped after dismantling (also shows some of the parts that needed to be repainted by a professional).  
 I have decided to clean in stages as I dismantle and rebuild each section.

## 4.0 Rebuild

### 4.0.1 WORKING ON THE ENGINE



Original state of the engine

**Application**  
 Very "thorough" development of all aspects of the research. Every process is followed through and explored.

After consultation with WH about some things to particularly look out for when dismantling and rebuilding the engine

- I learned that I would need to use a high pressure wash machine to clean and remove the oil (luckily we already have one of these and I have used it before).
- pull apart required components and inspect for damage.
- Measure engine tolerances.
- Sandblast cylinder head.
- Purchase new sparkplug port.



#### ETHICAL ISSUES:

Before dismantling the engine I knew that there would be some oil to drain and dispose of. I looked in the Yellow Pages and found a company that will pick up waste oil free of charge as they will reuse it!!! (Mulhern Waste Company) Great news! They suggested putting it in a large strong plastic bucket. I was really pleased.

#### 18/6/10 I viewed YouTube video – rebuild a moped

<http://www.youtube.com/watch?v=ylt1rjqcQ1g>

This was helpful to me because I gained knowledge about:

- how to inspect engine components
- clean and remove gaskets
- where parts could be purchased (although this was in the USA, it did give me some ideas about the sort of places I might look in Australia)
- reassembly, modifications, maintenance areas that will help in the future (e.g. things that can go wrong over time)
- how to remove carbon buildup with solvents – kerosene, steel brushes, white spirits, sandpaper, steel wool
- spark plug cleaning with petrol – this sounds a bit unsafe to me!

**Application**  
Analyses YouTube and reports on the most useful information obtained to help further develop the research.

Using information from this YouTube clip and the service manual, I pulled apart the engine cylinder components and inspected for damage.

**PROBLEM:** While dismantling the cylinder I discovered an oil leak which I investigated. I was determined source of oil leak. Decided new gaskets needed, so did my research online:

**SOLUTION:** Discovered great site for parts: [www.bikebandit.com](http://www.bikebandit.com) online. Ordered gasket parts.

**PROBLEM** - I realised there is a flat rate of US\$110 for postage which was more than the parts.

**SOLUTION.** Research other options for gaskets. Online searching. [MotorcycleRecyclers.com.au](http://MotorcycleRecyclers.com.au). Found a full kit for a Yamaha PW50 which looked like my engine, so I sent an email to ask if this was the same as the QT50 kit. Parts were ordered and I was very happy with the outcome.

**Application**  
Resourceful solution to problem.

Gasket kit arrived. I test fitted components.

Called WH and he told me that the important things to consider when replacing the gaskets were:

- check piston rings for scoring
- hone cylinder bore using a hone with fine stones. Hone no more than required to remove wear marks
- apply kerosene and clean all components properly as metal dust will damage engine.

## Cylinder head –



As you can see, the engine components of the cylinder head were rusted and had corrosion.

I followed instructions from the Service Manual, e.g. to remove warpage, have to resurface by rubbing on 400 grit sandpaper using a figure 8 sanding pattern.

I thought about purchasing a new cylinder head as these are really important parts but decided to persist. WH was very helpful again in a short phone call. He suggested that the parts be sandblasted, acid cleaned, sanded and polished. Components were painted in Kill Rust to prevent further damage.

## Reflection

Getting great deal of knowledge about engines. Did not have much experience in pulling apart an engine. Worried about forgetting how to reassemble the motor – so used the photographs in the service manual. The engine condition was overall very clean. Having never seen it work/run it was a big unknown. All measurements of engine parts were taken using the Vernier Calipers as the service manual suggested and they were within tolerance by the manufacturers, which meant I could reuse them.

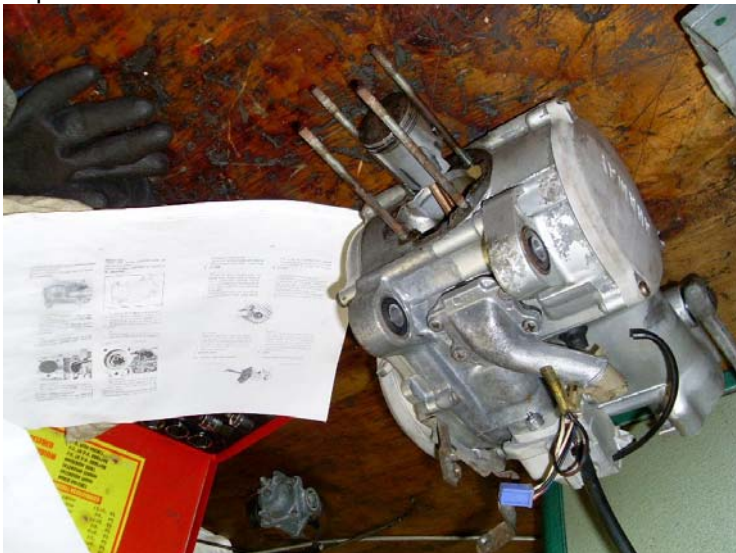
Measurements of the piston and the cylinder bore were taken as seen below:

*Test Results of measurement - Piston Size = 40.20 mm Wear Limit = 40.10mm  
Outcome: Piston is OK to reuse*

*Test Results of measurement – Cylinder bore size = 40.30mm. Wear Limit=40.50mm  
Outcome: Cylinder bore is OK to reuse*

This was a very time consuming process but worth it in the long run.

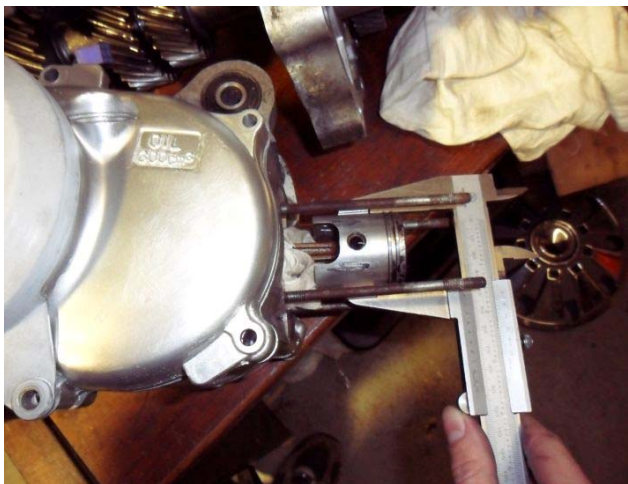
I continued replacing all the gaskets and completed maintenance cleaning as recommended in the service manual which was a fantastic reference for this exercise. When I had trouble reassembling any part of the engine I simply followed the step by step guide for fitment and tensioning requirements.



Using the manual

**Application**  
Highly effectively applies skills and knowledge about precise measurements to test components to ensure they can be re-used.





Measuring the piston with the Vernier Calipers.

Process for Rear driveshaft – Luckily there was no damage here when I took it apart. It was just dry, dirty, and required cleaning. The service manual said to grease it every two years using a lithium based grease. I followed the diagram in the service manual to position grease for reassembly. All parts of the rear driveshaft were re-greased, cleaned and painted. Weren't any dramas here.

Engine was then reassembled using the Service Manual as my guide.

New Skills learnt during the dismantling and rebuilding of the engine– :

- How to pull apart engines
- How to measure engine components for proper function
- Importance of taking photos during disassembly
- Checking head for warpage using surface plate
- Honing cylinder bore techniques to remove wear marks
- Cleaning techniques for rear drive axle
- How to check rear drive axle for run out
- Applying grease to moving parts
- Engine maintenance
- Tension requirements for reassembly.

Skills and Knowledge gained and applied

**Application**  
Identifies, applies and uses topic specific skills very effectively – proof is in the detail and sparkling quality of the finished product.

ENGINE IS COMPLETED – It looks fantastic!



Response to Challenge – change of direction

I originally set out to rebuild moped using original components. Due to research findings project is becoming too expensive. E.g. genuine scooter seat cover \$64 US, whereas replica (called an aftermarket copy) is \$24.90.

Is a pity, I feel really let down, but I don't think the average person would know the difference. Have decided I will only buy the original if no other option, e.g. no other parts available.

REFINEMENT OF TOPIC: Rebuild a Yamaha QT50, only using genuine parts if no other parts are available

**4.0.2 FRAMEWORK –**

To do list

- completely strip all components
- load parts into car that require painting, ring pro-finish custom painting and organize time for quotation
- polish forks and handle bars
- order Yamaha emblems

When pulling apart moped framework– some parts were rusted and seized together.



Had phone conversation with W H – advised an anti seize lubricant which releases rusted threads. I used this and was able to loosen and remove the rust so that I could dismantle this part of the bodywork without damaging it.

After dismantling this part of the moped here is the list of parts that need repainting and re-chroming :

- frame
- plastic components
- foot rests
- headlight surround
- number plate bracket
- rims
- rear basket
- front basket
- engine components, cylinder head, engine side covers
- rear drive shaft and hub set up.

Research Processes – observation and analysis of information



Some of the parts and components that need repainting and re-chroming.

**PROBLEM:** think the moped’s paint condition is too damaged for me to do a good job. It’s rusty, faded, flaking off in places. Needs an expert to do job or will look very amateurish. Advice from WH – put me on to another professional (Pro-Finish custom painting)

Contacted Pro-Finish - Got quote (\$250).

Will compare with another quote - Contacted tradesperson I knew from school, visited workshop – his quote came in at \$700. This person insisted the components had to be dipped in acid first, to prevent rust, which made it more expensive – probably worth it, but just too pricey for me.

Research Processes – trial and error -consultation with experts -observation -web-based -consultation with experts -testing -sourcing and comparing quotes

**Planning**  
Further refinement of topic in response to the way the research has developed and financial constraints.

**Application**  
Highly resourceful development – evidence of taking initiative in response to challenges and opportunities that arise.

Another painting problem, mudguards and brackets. Plastic was sun damaged and metal rusted. I cleaned this with kerosene as the YouTube clip said, but after the first coat of paint, some sort of reaction had occurred. Consulted WH - (explained -Due to cleaning with kerosene – the paint reacted to the oil in the kerosene base product). Suggested to re-sand mudguard, clean with thinners and repaint.

Followed this advice and it worked without a paint reaction.

NOTE – will not clean the rear mudguard with kerosene!!!

Research Paint colour

(Google search) to discover the name of the original paint colour: Majolica Blue

[http://www.jacksscootershop.com/Yamaha\\_VIN.html](http://www.jacksscootershop.com/Yamaha_VIN.html)

Research – observation, action research.

The tradesperson from Pro-Finish- allowed me to enter his workshop and showed me through stages of preparing the frame for painting. He said it would get a much better finish due to the rust eating into the metal if I used a bare metal preparation. This involved removing all the original paint.

Consumed many hours of time – using different methods. Learnt many new skills from taking part:

- use sand paper ( e.g. 320 grit sandpaper) or a power sander, or a sandblaster
- clean the entire surface using a grease and wax remover
- Best not to use paint thinner or mineral spirits as can leave a residue
- Wipe surface dry with a tack cloth
- Also have to be careful to drag the cloth across the surface and not rub or you will get bits of the tack cloth stuck on the surface
- And even though it added \$250 to cost I think it was worth it as can be seen in the photo below.

Luckily I didn't have to cut away any parts that were so damaged or rusted and patch them up with 18 to 22 gauge metal, which would have needed a cutting and welding torch. I have never used one of those, although I would like to learn. This cleaning really took the most time. Imagine how long it would take if you were doing a car!!!!

Then we had to prime the surface using even strokes to apply a urethane primer. This is then sanded down to even it out using a method called "blocking" – use a 400 grit sandpaper around a rigid block. He used two coats of paint which took 90 minutes each to dry, followed by three coats of paint that each took 15 minutes to dry.

Seems like the best \$250 spent – the paint job was so professional with no imperfections.



According to WH and the manual, with Rebuilding – one of the main activities is test fitting the components – to make sure they fit.

**RUSTY PARTS NEEDING RE-CHROMING:**

1. Research in Phone book in Yellow pages
2. Load all parts in car
3. Visit business and obtain quotes
4. Compare prices for quality v cost
5. Book in job
6. Pick up parts

**Application**  
Extremely thorough development of all aspects of research. Explores every avenue.

**Comparison of quotes for re-chroming:**

Quote A	Quote B
Quote = \$70 for front headlight surround \$90 for rear basket including polishing	Quote = \$45 for front headlight surround \$45 for rear basket including polishing
Wait time = 3 weeks	Wait time = 2 weeks
TOTAL = \$160	TOTAL = \$90

Winner = Quote B



After visiting both businesses - also learned that I cant chrome the wheels unless they are completely pulled apart. This is a task that will risk further damage to the wheels due to their rusted components. Recommended to paint and polish the wheels. Will need to have old tyres professionally removed and buy new tyres I think, otherwise I will risk damaging the rims.

#### 4.0.3 WHEELS AND TYRES – Things to do:

- Investigate legal requirements re tyre specifications for these bikes in SA
- Research in phone book for local motor cycle tyre shops
- Get tyres stripped from rims
- Get advice from WH re polishing techniques for chrome rims
- Do paint and polish of rims.

#### Legal Requirements: Quote From Transport SA website –

*Motorcycle tyres which are marked 'not for highway use' or have a marking meaning the same, must not be fitted to motorcycles used on public roads. It is recommended that only tyres of the size and speed rating specified by the motorcycle manufacturer are fitted to the motorbike.*

#### Tyre specifications from QT50 Service Manual:

- Front 225 14" (Yokohama brand)
- Rear 225 14"

PROBLEM – After checking out shops in Adelaide NO tyres available in SA for my moped! Very frustrating. One old man with his own motorcycle business gave me a list of every contact he knows that deals in tyres - no one had them due to the vintage age of the moped.

Will have to research on line again! Was quite difficult to find but did so eventually at a reasonable cost from Tiaro Motorcycle wreckers (in Qld) - \$83 delivered)

Delivered the wheels to Total Motorcycles to have the old tyres removed. Also ordered two new tubes as old tubes were damaged due to age.

#### THE RIMS

Need to gather knowledge about how to restore my very rusty old rims to the original. Will interview WH

#### Interview with WH

Re Rust removal, painting and polishing techniques for wheels and rims

Research Processes –  
Interview with expert

Most important – is  
preparation, preparation  
preparation.

- 1) Where do you recommend to start when faced with such poor condition rims?

Lightly remove all heavy rust with coarse sandpaper, also using wire brush. Gradually change to less coarse sandpaper to remove scratches, then finish with steel wool. Do not concentrate on one area – constantly move around rim.

- 2) What products do I need to purchase to aid with cleaning rims and dust removal?

Steel wool, 100 grade sandpaper, 800 grade sandpaper, water (bucket), scourer, wire brush, thinner solvent, For paint use Kill Rust spray paint as this prevents rust from coming back

- 3) Any tips regarding painting for a beginner?

Preparation is important. Make sure all oils and dust has been cleaned with thinners solvent. Purchase Kill Rust spray cans and shake well before use. Wear a mask for breathing and lay down paper on the ground to avoid painting the ground.

- 4) Further comments you would like to add?

Paint components on warm day as end result will improve with heat.

Preparation – the more effort you put in, determines whether it is a quality or poor finish.

When rims are painted (make sure they are dry) - use steel wool to bring out the chrome finish in the rims.



**Application**  
Highly effective application of knowledge and skills – student researches how to polish metal and applies relevant research.

The rims – before and after! \*Followed WH's process on this. Even though they are 30 years old they look amazing – restored and new!

Next step – was restoring the throttle.

Was a bit rusty and tarnished.

I didn't know anything about polishing – skills. I used the knowledge I got from doing the wheels.

Again WH was really helpful in giving me expert advice on this. This is the process I followed:

- Light sandpaper all over the parts
- Wash with kerosene
- When dry, use a product called 'Autosol' to rub down the throttle and its parts

Looked up how to polish metal using 'Autosol' on YouTube

<http://www.youtube.com/watch?v=rvY2SBIFewg> (The Polish Guy, 2008) - very helpful

These are the important tips from that video:

- Wear Nitro gloves
- Squeeze a bit out of the tube and rub into surface with finger tip of your glove.
- Can use micro fibre cloth but is more wasteful
- Rub the 'Autosol' onto the surface and when complete leave for a few moments.
- Then take a microfiber cloth and start to rub it off
- Then buff with a microfiber cloth.

I used a microfiber cloth and it worked really well as didn't have Nitro gloves. The throttle came up like new!

Even though it was time consuming it worked well. The only other option I could have used was to pay a professional. But this would have been too expensive and as it was I learnt more new skills and gained knowledge I didn't have before.

#### PROBLEM: MORE BROKEN PARTS

- as rebuilding the front hub parts realized that more parts were broken – e.g. Speedo gear, Speedo cable, rusted/seized front brake cable.
- Frustrating as many damaged components were overlooked at the beginning but when focusing on rebuilding a particular area this becomes apparent.
- Then I need to investigate parts online to solve the latest issue
- Research on eBay for these cables

Tail light lens – replacement purchased on eBay.

Photograph of my seat.



#### **4.0.4 SEAT RESTORATION**

Needed to find a seat cover and a motor trimmer to fit it. Purchased a replica seat on Ebay (1/3 cost of original). Still needed to find someone to refit it.

Google search for Motor Trimmers – turned up 7 businesses. I telephone the first three. Only one who was able to do the work quoted \$90 Minimum. Decided to visit one of the businesses close to home only to find out that business had moved. As I was leaving the industrial area I noticed a furniture upholstery business and decided to drop in and see if they would refit the new cover.

Learnt the value of getting more than one quote. This upholstery business (Massoud Upholstery) quoted me \$50 for the refit, so I saved myself \$40. Even though the owner instructed me on how to remove the old seat cover by removing the staples, I thought it was worth getting it done professionally.

# Missing Ignition switch / key.

## PROBLEM Ⓜ

*CRITICAL Reflection*

When rebuilding Moped, I have slowly been piecing together all components. The dash console was missing the ignition switch / key. A vital part to make moped run / operate. From research online I found two options.

Home page Who we are and How to Contact Us Contact Model Identification

Find Parts and Accessories  
Enter a Bike Model or Part Name or Part Number

Advanced search

Genuine & Aftermarket Parts  
Yamaha Parts  
Honda Parts  
Suzuki Parts  
Kawasaki Parts  
KTM Parts  
Classic Replica Parts  
How to? Information Pages  
Links to useful friends....  
Trips - White Line Fever....  
Motorcycle Calculator Tool

Shopping basket  
Your shopping basket is empty.

Sign in  
User name  
Password  
Sign in  
Forgot your password?  
Register

Shop now using **PayPal**

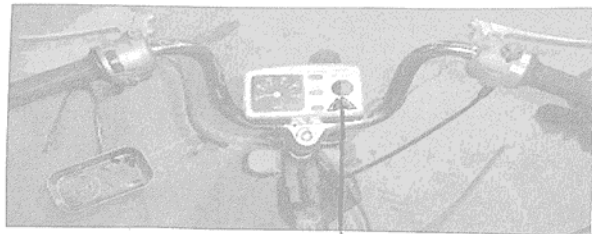
Detail view

**Aftermarket Replacement Ignition Switch Assembly - Universal**  
A Universal two wire On/Off Ignition switch  
Two keys supplied  
Numbered - tag attached  
Orange cover over key hole to protect against dust/rain and make it easy to find the correct hole.  
Dimensions:  
Diameter: 19mm  
Length from base to binnacle: 45mm  
Total length: 50mm  
No mount plate supplied, but ally plate is good - requires 20mm hole  
Lock nut with zinc lock washer to keep it all together. Lock nut 21mm  
Two male pin connectors in a plastic lock housing  
Wires are 120mm long to top of plastic lock housing  
Some bikes may need to have alternate fittings attached.  
SA1

Product is In stock  
Delivery period: 3 day(s)

AU\$58.47

*After market component.*

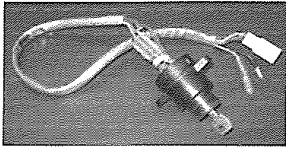


*Dash control assembly missing ignition switch / key.*

Back to My eBay | Listed in category: eBay Motors > Parts & Accessories > Other Vehicle Parts > Scooter Parts

You bought this item | View order details

### Yamaha QT50 Yamahopper Key Ignition Switch QT 50



Item condition: Used

Sold For: **US \$59.00**

[Add to list](#)

Returns: 7 day money back | [Read details](#)

Shipping: **\$9.55** USPS First Class Mail International | [See all details](#)  
Estimated delivery times for items shipped from an international location.



**eBay Buyer Protection**  
 eBay will cover your purchase price plus original shipping.  
[Learn more](#)

#### Seller info

papamikeshikes (11073)   
 100% Positive feedback

[Ask a question](#)  
[Save this seller](#)  
[See other items](#)

Visit store: Papa Mike's Bikes

#### Other item info

Item number: 360295679039  
 Item location: pasadena, ca., United States  
 Ships to: Worldwide  
 Payments: PayPal [See details](#)

[Share](#)    [Print](#)  
[Report item](#)

[Description](#)    [Shipping and payment](#)    [Buying tips](#)

Seller assumes all responsibility for this listing.

#### Item Specifics

Condition: Used. An item that has been used previously. The item may have some signs of cosmetic wear, but is fully ... [Read more](#)    Warranty: No

This is an "ON/OFF" only ignition switch and comes with 1 factory original Yamaha key. This fits on the Yamahopper QT50 model. Some models have a 3 clicks including one for starting or neutral but this switch is 1 models with just ON/OFF.

*Problem solved!*

*Original component*

### *Comparing Products available.*

#### *Aftermarket*

#### *Original*

<i>+</i>	<i>-</i>	<i>+</i>	<i>-</i>
<ul style="list-style-type: none"> <li>- Item is brand new guaranteed to work.</li> <li>- two keys supplied</li> <li>- Product is in Australia which would mean only 3 days waiting for post and cheap freight cost.</li> </ul>	<ul style="list-style-type: none"> <li>- unsure of wiring diagram.</li> <li>- will need to modify wiring to suit my moped.</li> <li>- Not a direct fit in dash assembly - will need modifying.</li> </ul>	<ul style="list-style-type: none"> <li>- Direct fit to dash assembly.</li> <li>- Wiring will plug in directly to my moped plugs.</li> </ul>	<ul style="list-style-type: none"> <li>- secondhand.</li> <li>- unable to test whether it works or not ↓</li> <li>- Need to trust seller.</li> <li>- International freight cost and long delivery time</li> <li>- No Warranty</li> </ul>

*Purchased OEM item (Genuine Switch) was faulty - further inspection revealed broken wires part of problem causing no spark.*

**Application**  
 In-depth analysis and exploration of ideas regarding which particular switch to purchase.

## Attempt to start the moped

### PROBLEM – NO Spark

- had followed all steps in service manual of how to start and test components for function.

- First attempt to start – showed nothing

-Concern – have no experience in electronics and diagnosing this problem was going to be trial and error, based on other people's experience in forum.

GOOGLE SEARCH FOR 'SOLUTION TO NO SPARK'Showing results for **yamaha** QT 50 no spark. Search instead for **yamaha** QT 50 no sparkSearch Results

1. Moped Army - **yamaha QT50 no spark**  
14 Jul 2008 ... Just bought a 1982 **QT50. No spark**, Replaced the plug still nothing. Replaced spark coil and boot. Still would not fire. ...  
[www.mopedarmy.com/forums/discuss/6/135744/135744/](http://www.mopedarmy.com/forums/discuss/6/135744/135744/) -  
LOTS of **Yamaha QT50** QT60 Performance Parts, JEMCO! - 17 Jan 2010 exploration and Help! **Yamaha QT50** - 18mph max & Slow off the m - 24 Oct 2009  
1980 **Yamaha QT50** - 25 May 2005  
More results from mopedarmy.com »

2. **Yamaha QT50** - Wikipedia, the free Encyclopedia  
The Yamahopper is not really a scooter, as the **QT50** has **no** fairing, sports footpegs ... ignition supplies a stronger than normal **spark** for initial starting , ...  
[en.wikipedia.org/wiki/Yamaha\\_QT50](http://en.wikipedia.org/wiki/Yamaha_QT50) -

3. Motorcycle Questions - I have a **Yamaha QT50**, I cant get a **spark** to ...  
17 Aug 2008 ... I have a **Yamaha QT50**, I can't get a spark to the plug. ... I have checked the plug gap .24 to .28 on a new plug. **no spark**. checked the cdi ...  
[www.justanswer.com/.../1d5hc-yamaha-qt50-can-t-spark-plug.html](http://www.justanswer.com/.../1d5hc-yamaha-qt50-can-t-spark-plug.html) -

Re: yamaha QT50 no spark

- Author: peterg (---.ri.ri.cox.net)
- Verified User: peterg
- Date Posted: 07-14-08 23:16

Research Processes:  
Web –based research  
Checking online forums

**Application**  
Highly resourceful development of the research using expert advice located on specialist forums.

**check/clean all connections, one at a time so you don't mix them up.** I seem to remember something about grounding, also...

- discovered from research forums that it was likely that electrical components were missing. Followed advice to check/clean all connections one at a time. Found one plug not connected properly. Checked the wiring diagram with the ----- and confirmed likelihood of missing components but still not confident

[bwdbnr1](#)  
Registered-II

Join Date: Mar 2010  
Location: Rock Island, Illinois  
Posts: 97  
Thanks: 5  
Thanked 40 Times in 32 Posts

## **Yamaha moped electrics**

I've tried other forums, so I'll try this one too. I picked up a little 50cc Yamaha QT50 moped. It's a very clean little machine, and doesn't look to have been abused, but I can't get spark to the plug. It's got a 6v system. I've put in a new battery as the old one was toast. New rectifier, as the original was missing completely, and a new fuse and fuse holder as they were missing too. I used a spade type fuse, and it calls for a 10amp.

Somewhere along the line, somebody before me evidently replaced the charging coil. The stator tested O.K. on a multimeter on the bench, but the ignition coil tested bad. Installed a new ignition coil, but I'm still not getting spark. I can let the coil dangle from the input lead, and I get a flash on a circuit tester out at the plug end, but not with a spark plug, and as soon as I attach the coil to the bike, I don't get anything.

So, question is where do I begin to start checking now.

[bwdbnr1](#)  
Registered-II

Join Date: Mar 2010  
Location: Rock Island, Illinois  
Posts: 97  
Thanks: 5  
Thanked 40 Times in 32 Posts

## **Re: Yamaha moped electrics**

Turned out to be the charging coil. Put a new one in and it started after three kicks. It's got other issues that need to be looked into, leaky case seal, can't get the mixture right, and it's becoming one of those man vs. machine things now, but it runs, and that's a good thing.

<http://www.smokstak.com/forum/showthread.php?t=79909>

- Learnt new skills - ability to make up two wires and joining them together – result – complete electrical circuit that created spark.

SmokStak > SmokStak@ Antique Engine Community > Small  
 Air Cooled Gasoline Engines > Garden Tractors / Mowers /  
 Scooters  
**Yamaha moped electrics**

User Name:  User Name  Remember Me?  
 Password:    
[Forgot Password?](#)

[Register](#) [Gallery](#) [FAQ](#) [Calendar Events](#) [Today's Posts](#) [Search](#)

09-01-2010, 07:24 AM #1  
**bwdbrn1** *Another forum with someone experiencing similar problem.*  
 Registered-II  
 Join Date: Mar 2010  
 Location: Rock Island, Illinois  
 Posts: 56  
 Thanks: 1  
 Thanked 19 Times in 16 Posts

**Re: Yamaha moped electrics**

I've tried other forums, so I'll try this one too. I picked up a little 50cc Yamaha QT50 moped. It's a very clean little machine, and doesn't look to have been abused, but I can't get spark to the plug. It's got a 6v system. I've put in a new battery as the old one was toast. New rectifier, as the original was missing completely, and a new fuse and fuse holder as they were missing too. I used a spade type fuse, and it calls for a 10amp.

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So, question is where do I begin to start checking now.



09-12-2010, 06:56 AM #6  
**bwdbrn1**   
 Registered-II  
 Join Date: Mar 2010  
 Location: Rock Island, Illinois  
 Posts: 56  
 Thanks: 1  
 Thanked 19 Times in 16 Posts

**Re: Yamaha moped electrics**

Turned out to be the charging coil. Put a new one in and it started after three kicks. It's got other issues that need to be looked into, leaky case seal, can't get the mixture right, and it's becoming one of those man vs. machine things now, but it runs, and that's a good thing.

*From reading/researching this forum it brought to my attention areas of the electrical system that I totally overlooked. My moped was missing various electrical components that require it to run. These were traced down using wiring diagram, part by part.*

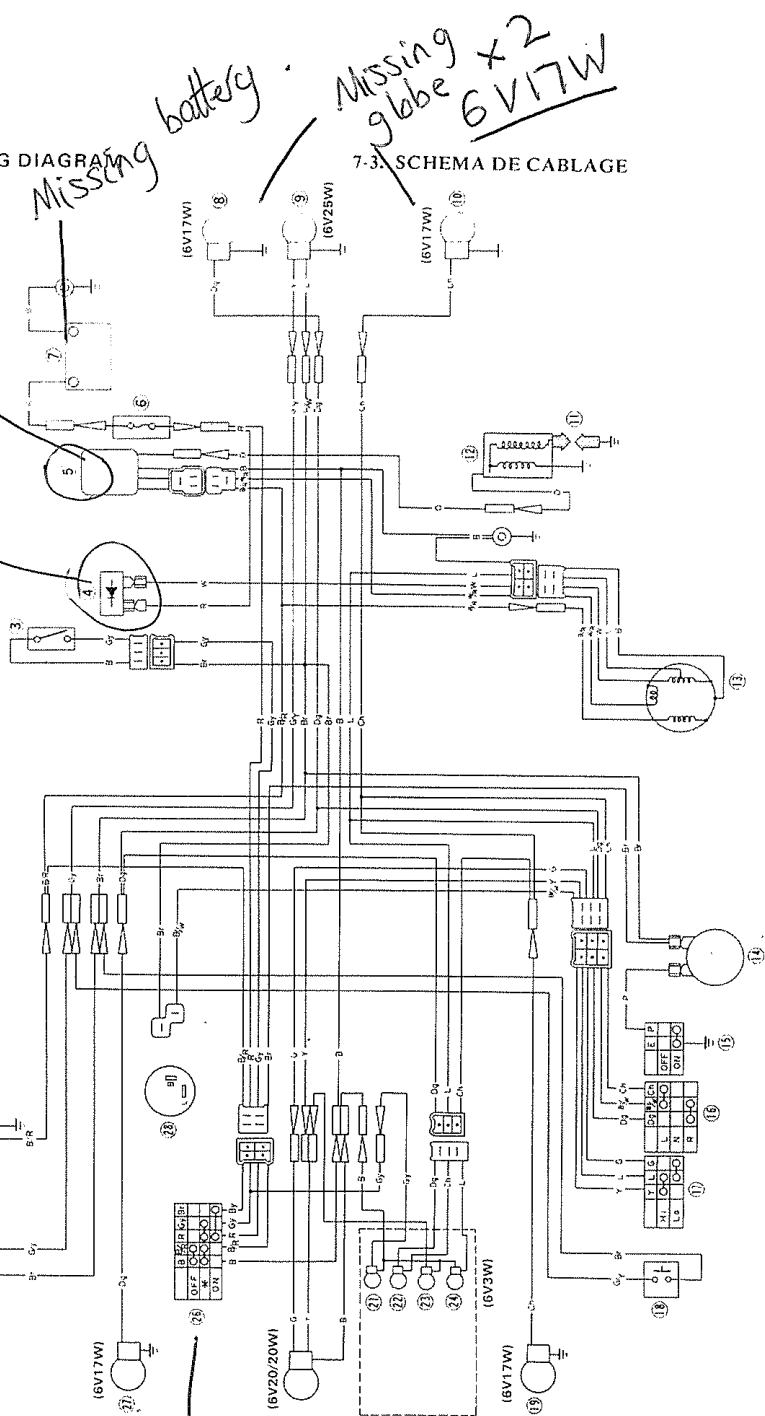


# Yamaha QT50 1979 Wiring diagram.

Missing Rectifier.  
Missing Cond. 1.5µF

7-3. WIRING DIAGRAM

7-3. SCHEMA DE CABLAGE



Missing battery  
Missing globe x2  
6V17W

Missing

Missing Switch (Has now been replaced but could be faulty)

I used this and a book from Dick Smith that I bought called *Basic Electronics* and learnt how to:

- read wiring diagram
- All wiring has a colour code and needs to be matched
- Need to have earth connected to ground
- How to test for electricity
- How to diagnose a problem
- Soldering wires.

I didn't know any of this or have any of these skills before!!!!

Managed to get engine to run for 5-10 seconds before cutting out!!!!!! So this problem is still not solved.

Further research is required.

Found a YouTube where a guy was having a similar problem to me and there was a lot of helpful comments under the YouTube  
<http://www.youtube.com/watch?v=NX4rRTh5fFY> See below !

Research Processes: Web-based Looking on YouTube for information to solve the electrical problem
---

- this guy is right, i have owned a couple of those exact mopeds and the problem with mine was the fuel filter was clogged.

[cjmotorsified](#) 11 months ago

- **FUEL!!!!** If it starts for a few seconds then cuts out it's fuel! NOT ENOUGH FUEL!!! Did you check the in tank fuel filters? They are in the tank attached to the top of the petcock. They're just little screens. Blow them out and soak the petcock in high octane gas. They get corroded BAD! I just popped both of them off the petcock and installed an inline filter from a riding mower, I suggest you do the same. The low bog sound is lean, a high pitch or a every other time firing is too rich.

[galactophore](#) 1 year ago

Followed advice from this - realized one area I had overlooked while rebuilding was the fuel tank. It was full of rust/dirt and was blocking the fuel filter. Cleaned the filter and moped runs properly.

## 5.0 Register and Ride

### 5.0.1 TEST DRIVE

It's alive, throughout the test ride the moped felt good. Engine operated smoothly without a misfire. I got a lot of attention from pedestrians and motorists. After test ride performed a full spanner check (as per tension requirements in service manual).

### 5.0.2. REGISTRATION

Phone call to Transport SA – re how to get it registered:

- Discovered that needed previous owner's name.
- Research to solve this problem -Looking at photos on a Yamaha QT50 webpage came across photos of my moped put on line by previous owner!!!!!! How lucky!!!
- able to contact him and got necessary details.
- Got it registered!

Fully able to ride it legally! What a rush!

### **NEW IDEA for Research Outcome**

All through the project it has been very time consuming to get information. I have come up with the idea for my outcome to be a Google Site. It will have a main page of advice for people who want to restore a moped. Then I will put all the photos and specific details from this folio into other pages that can be accessed from the main page. This would have been really helpful to me and hopefully will be great for others.



# ASSESSMENT TYPE 1: The Folio

## PART C: The Discussion

The formal discussion took place near the end of the research project. We were given a list of questions and I prepared some answers. After the discussion I added some reflections on what I said and the feedback I got in the discussion.

### How have you refined your research topic, if at all?

It was pretty specific to start with, e.g. rebuilding a Yamaha QT50 to vintage specifications. The demands of cost and time have meant that I have had to refine this just to rebuilding a Yamaha QT50.

Reflection: In a way this topic is more general and less specific than it was to start with but it is just necessary

### How effective and manageable are the research processes that you originally planned?

1. Work Breakdown Structure and Gantt chart -incredibly detailed and covered everything could think of at the time.
2. The sequence and the time allocation turned out differently.
3. I found that some things took longer than others and that I actually often had a number of processes on the go at the same time, while I was waiting for parts to arrive, or while I was waiting for the parts to be painted, I needed to be going on with something else, so I started another part of the rebuilding. If I hadn't done this, then I would be way behind time.
4. I had originally planned to repaint the bodywork myself. After a bit of research into the process of doing this to the professional standards was hoping to achieve (through consulting an expert on body work, and reading this up on Forums, and a bit of experimentation), realized that I couldn't do it to the standard I wanted, so I then had to do more research, like a trade study to get quotes from paint places to do it for me. So that meant I didn't get to personally undertake that research process of implementing the techniques I'd found out about. Even though it ate into my budget it was worth it in the end.
5. Also, while it was dismantling moped I realized that there were some things I would have to do that I had not planned for originally. I didn't realize, for example that the rust would be so severe it was too difficult to get the parts apart without damaging them, so I had to research how to do this.
6. Also sometimes I discovered that more parts needed repairing than I had planned – such as when I was rebuilding the front hub I realized that there was a broken Speedo gear, broken Speedo cable and rusted/seized front brake and cable. SO needed to purchase those parts
7. I didn't anticipate everything in my original plan or all the research processes.

### How are you showing consideration of safe and ethical research processes?

1. I have learned a lot mostly about OHSW and safe work practices when doing trial and error, observation and experimentation research processes. Have learned and have followed practices recommended by WH, the expert vehicle restorer, to wear covered shoes, long sleeved trousers, shirts, safety glasses, gloves (with some coverings).
2. This research has also meant I take care of my safety while undertaking this practical research.

### Are the research processes producing the information required to investigate the research topic?

Yes –Yamaha QT50 service manual – this is absolutely essential. Don't know what I would do without it. Has such detailed drawings and step by step instructions, normally for a mechanic servicing a moped, but they are gold me – even though I don't have all the technical knowledge of a specialist bike mechanic.

WH was really helpful with information on techniques and skills for restoring, even though he is a motor vehicle restorer and has never done a moped. His knowledge is able to be applied to my research on mopeds.

Online research processes have on the whole been the most successful processes I have used to locate the information I needed:

**Application**  
Analysis of  
information  
gained.

- YouTube and Online Forums – really helpful, particularly as there doesn't seem to be any books published about mopeds, so have to rely on experts (some of them ordinary people like me who just have a bit of a hobby) and enthusiasts. But it is amazing how other people have had similar problems to me – like the fuel problem, and just like me they have worked out a solution by trial and error!
- eBay research for parts.

Trial and error – e.g. used kerosene to clean the sun damage and rust off the paint of mudguard +brackets. After the first coat of paint- reaction occurred. Expert Phil Hoffman said the oil in the oil based kerosene reacted with paint', so told me to re-sand it, clean with thinners and repaint. Did this and worked and followed this process with the other mudguard and worked well.

**What important ideas and findings emerging from the research so far, and how they have developed directly or indirectly from the research processes?**

*Necessity for a manual when rebuilding a moped (from Robert Livesay's website)*

***What skills and knowledge specific to your topic have you been developing? Which of these are new and which already existed?***

- had some skills from apprenticeship e.g. skills in precision work in putting metal parts together, checking the accuracy of finished parts. I was comfortable with machinery – but these had not been applied before in the area of motor vehicle engines, particularly moped engines. . Many of the other skills I already had were not relevant e.g. using the designing tools such as CAD and CNC machines, robotics.

Probably already had problem solving skills that have needed and developed further in this research project. in Job Descriptions

Didn't have any knowledge or skills about moped or motor vehicle engines. Skills specific to this topic that I have developed, either through observation, advice from experts (realtime or online), trial and error, studying the service manual:

- Disassembling an engine
- Measuring engine components for proper function using Vernier Clips
- Honing the cylinder bore to remove wear marks using a hone with fine stones
- Checking head for warpage using surface plate
- Cleaning techniques for rear axle drive
- Applying grease to moving parts
- Tension requirements of engine parts
- Polishing metal components
- Preparation of metal for painting
- Soldering wires
- How to test for electricity.

**What challenges have you faced and how have you overcome them?**

-lack of local expert knowledge or availability of parts on vintage Yamaha mopeds in Adelaide.

-early research - really good model to buy because parts would be available locally.

- every step along the way - were no parts available locally in Adelaide.

- had to show lot more initiative look for alternative sources through research. Thank God for the internet. I found a number of overseas and Australian sites who had the parts I needed, usually in vintage specifications. Everything has in fact been purchased interstate or internationally. I couldn't even get a globe for the moped as the one required is an old style that is no longer used.

-having to my topic to just rebuild it, not necessarily to vintage specifications.

**What are your thoughts about your chosen capability, work?**

Still most relevant – so many employability skills have been learned:

All the skills mentioned above:

Budgeting, OHSW practices, Talking to people I don't know, working independently

Problem solving

**My question at the discussion was about my new idea for my Outcome**

I found that there was a real need for detailed accurate information about all stages of the restoring and rebuilding process of the moped, ideally in one location, such as a website, or a link on a Forum – looking over individual forum entries had been helpful for me to find information I needed. thinking about preparing the information for a website bringing together all the things I had learned about the process for others. Teacher said it was a great idea.



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# Stage 2 Research Project Performance Standards extract for Assessment.

## Assessment Type 1: Folio

### Moped student work sample.

	<i>Planning</i>	<i>Application</i>
<b>A</b>	<p>Thorough consideration and refinement of a research topic.</p> <p>Thorough planning of research processes that are highly appropriate to the research topic.</p>	<p>Thorough and highly resourceful development of the research.</p> <p>In-depth analysis of information and exploration of ideas to develop the research.</p> <p>Highly effective application of knowledge and skills specific to the research topic.</p>
<b>B</b>	<p>Consideration of the main area of research and some refinement of a research topic.</p> <p>Considered planning of research processes that are appropriate to the research topic.</p>	<p>Considered and mostly resourceful development of the research.</p> <p>Some complexity in analysis of information and exploration of ideas to develop the research.</p> <p>Effective application of knowledge and skills specific to the research topic.</p>
<b>C</b>	<p>Adequate consideration of a broad research topic, but little evidence of refining the topic.</p> <p>Satisfactory planning of research processes that are appropriate to the research topic.</p>	<p>Adequate development of the research.</p> <p>Adequate analysis of information and exploration of ideas to develop the research.</p> <p>Adequate application of knowledge and skills specific to the research topic.</p>
<b>D</b>	<p>Basic consideration and identification of some aspects of a research topic.</p> <p>Partial planning of research processes that may be appropriate to the research topic.</p>	<p>Development of some aspects of the research.</p> <p>Collection rather than analysis of information, with some superficial description of an idea to develop the research.</p> <p>Superficial application of some knowledge and skills specific to the research topic.</p>
<b>E</b>	<p>Attempted consideration and identification of an area of interest.</p> <p>Attempted planning of an aspect of the research process.</p>	<p>Attempted development of an aspect of the research project.</p> <p>Attempted collection of basic information, with some partial description of an idea.</p> <p>Attempted application of one or more skills that may be related to the research topic.</p>

## Assessment Type 1: Folio Grade A+

### Comments (including description of features that support assessment decision)

**P1** – topic is very refined, having a very specific context, e.g. even down to the model and year of the chosen moped (1979 Yamaha QT50). Also, to restore/rebuild to “vintage specifications.” Financial constraints meant this had to be further adapted to “rebuilding/restoring” it, rather than to “vintage specifications.”

Plenty of evidence of “thorough consideration” of topic is shown – particularly through the use of the Work Breakdown Structure – showing highly detailed thinking through of all the things that could/need to be researched.

**P2** – evidence of “thorough” planning of the research processes shown through the detail of the Gantt chart, giving a breakdown in time of all the procedures outlined in the Work Breakdown Structure. Processes are “highly appropriate” to the topic as they will enable the information needed to be located. A large variety of research processes have been planned (see Proposal as well). Even though there is a lot of emphasis on the internet, this is “highly” suitable, given the nature of the topic, and where resources and information are most likely to be found, e.g. the dearth of information, sources, resources in Adelaide. Within the web-based processes, all sorts of different sites are located, and experts are sourced from all over the world. Ethical considerations are identified addressed.

**A1** – meticulous record of research is provided. Research is “thorough” – as every area identified as requiring investigation is pursued. Shows resourcefulness as when challenges arise, a solution is sought and implemented, e.g. the difficulty finding a business to re-fit the seat. Uses text box annotations to provide evidence of the thorough and resourceful development of the research and application of topic specific knowledge and skills.

**A2** – analysis of information and ideas obtained is “insightful” and “in-depth” – as shown in the annotations to the sources and some processes, also the way the information is organised and presented through the structure of the processes planned in the Gantt chart.

**A3** – provides photographic evidence of use of topic-related skills and knowledge being developed (e.g. mechanical skills). Annotations and explicit summaries are provided of knowledge and skills developed and applied.