

# Pricing Simulator Manual

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Piazza della Croce Rossa, 1 - 00161 Roma

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## 1. INTRODUCTION

By decision of the Autorità di Regolazione dei Trasporti (*Transport Regulatory Authority*), notified with Decision No 95/2023, in Annex A. Measure 4, paragraph 4.3, subparagraph 1.h, this Infrastructure Manager makes available to interested parties a software aimed to calculate the Average Charge (AC).

Chapter 2 describes the graphical interface of the software.

Chapter 3 describes how to select the Segment and the year.

Chapter 4 describes how to define the technical characteristics of the rolling stock.

Chapter 5 describes the calculation of the Component A.

Chapter 6 describes the calculation of the Component B.

Chapter 7 describes the calculation of the Average Charge (*Importo Medio Unitario – IMU*).

## 1. GRAPHICAL INTERFACE

The software is based on Microsoft Excel© and it has only one sheet, as shown in Figure 1.

Treno viaggiatori	Tipo treno	Massa treno [t]	499	$T_{A1-2}$	$T_{A3}$	$T_{flot}$	$T_A$ [€/Km]	PEDAGGIO <sub>A</sub> [€]		
Premium	Segmento1	Categoria Massa Assiale	>18t/a	0,001290	0,398	0,130	1,172	760,77 €		
Mono Hub	Segmento2	Velocità di marcia [km/h]	108	0,644						
		Tipo di trazione	ELETRICA							
2025	Anno	Direzione	PARI							
Ricerca										
Origine	Par	Destinazione	Arr	Tempo	PEDAGGIO [€]	IMU [€/km]	km	$T_B$ [€/Km]	PEDAGGIO <sub>B</sub> [€]	
ROMA TERMINI	5:00	TORINO P.NUOVA	11:00	6:00	2.434,42 €	3,75 €	649,280	2,578	1.673,66 €	
Da località	Par	A località	Arr	Tempo	Tipo rete	Prestante	Periodo	Giorno	km	$T_B$ [€/Km]
ROMA TERMINI	5:00	ROMA TUSCOLANA	5:01	0:01	NODI Core		NOTTURNO	MAR-VEN	3,082	2,780
ROMA TUSCOLANA	5:01	MACCARESE	5:17	0:15	NODI Standard		NOTTURNO	MAR-VEN	27,976	1,390
MACCARESE	5:17	Montalto di Cas.	6:02	0:45	FOND Standard		NOTTURNO	MAR-VEN	81,766	1,390
Montalto di Cas.	6:02	PISA/bin. Pisa C	8:02	2:00	FOND Standard		DIURNO	MAR-VEN	216,467	2,780
PISA/bin. Pisa C	8:02	Dev Lucca/Spezia	8:03	0:01	COMPL Standard		DIURNO	MAR-VEN	1,794	1,946
Dev Lucca/Spezia	8:03	Genova Nervi	9:25	1:22	FOND Standard		DIURNO	MAR-VEN	148,583	2,780
Genova Nervi	9:25	Mignanego	9:41	0:15	NODI Base		DIURNO	MAR-VEN	27,201	2,502
Mignanego	9:41	ARQUATA SCRIVIA	9:51	0:10	FOND Standard		DIURNO	MAR-VEN	19,280	2,780
ARQUATA SCRIVIA	9:51	AL Cavalcavia	10:09	0:18	FOND Top		DIURNO	MAR-VEN	32,508	3,058
AL Cavalcavia	10:09	ALESSANDRIA	10:10	0:00	FOND Standard		DIURNO	MAR-VEN	0,548	2,780
ALESSANDRIA	10:10	TROFARELLO	10:52	0:42	FOND Top		DIURNO	MAR-VEN	77,045	3,058
TROFARELLO	10:52	TORINO P.NUOVA	11:00	0:07	NODI Standard		DIURNO	MAR-VEN	13,030	2,780

Figure 1: Graphical Interface



The colors of the cells have different meanings:

- **GREEN:** the headings;
- **BLUE:** the values implemented by the software;
- **ORANGE:** the values selectable by a drop-down list;
- **PINK:** the values fillable manually by the user.

Figure 2 shows the different areas of the interface, analysed in the following Chapters.

Treno viaggiatori	Tipo treno	Massa treno [t]	499	$T_{A1-2}$	$T_{A3}$	$T_{fer}$	$T_A$	PEDAGGIO <sub>A</sub>		
Premium	Segmento1	Categoria Massa Assi	>18t/a	0,001290	0,398	0,130	1,172	760,77 €		
Mono Hub	Segmento2	Velocità di marcia [km/h]	108	0,644						
		Tipo di trazione	ELETTRICA							
		Direzione	PARI							
2025	Anno									
Ricerca										
Origine	Par	Destinazione	Arr	Tempo	PEDAGGIO [€]	IMU [€/km]	km	$T_B$ [€/km]	PEDAGGIO <sub>B</sub> [€]	
ROMA TERMINI	5:00	TORINO P.NUOVA	11:00	6:00	2.434,42 €	3,75 €	649,280	2,780	1.673,66 €	
Da località	Par	A località	Arr	Tempo	Tipo rete	Prestante	Periodo	Giorno	km	$T_B$ [€/km]
ROMA TERMINI	5:00	ROMA TUSCOLANA	5:01	0:01	NODI Core		NOTTURNO	MAR-VEN	3,082	2,780
ROMA TUSCOLANA	5:01	MACCARESE	5:17	0:15	NODI Standard		NOTTURNO	MAR-VEN	27,976	1,390
MACCARESE	5:17	Montalto di Cas.	6:02	0:45	FOND Standard		NOTTURNO	MAR-VEN	81,766	1,390
Montalto di Cas.	6:02	PISA/bin. Pisa C	8:02	2:00	FOND Standard		DIURNO	MAR-VEN	216,467	2,780
PISA/bin. Pisa C	8:02	Dev Lucca/Speszia	8:03	0:03	COMPL Standard		DIURNO	MAR-VEN	1,794	1,945
Dev Lucca/Speszia	8:03	Genova Nervi	9:25	1:22	FOND Standard		DIURNO	MAR-VEN	148,583	2,780
Genova Nervi	9:25	Mignanego	9:41	0:15	NODI Base		DIURNO	MAR-VEN	27,201	2,780
Mignanego	9:41	ARQUATA SCRIVIA	9:51	0:10	FOND Standard		DIURNO	MAR-VEN	19,280	2,780
ARQUATA SCRIVIA	9:51	AL Cavalcavia	10:09	0:18	FOND Top		DIURNO	MAR-VEN	32,508	3,058
AL Cavalcavia	10:09	ALESSANDRIA	10:10	0:00	FOND Standard		DIURNO	MAR-VEN	3,348	2,780
ALESSANDRIA	10:10	TROFARELLO	10:52	0:42	FOND Top		DIURNO	MAR-VEN	77,045	3,058
TROFARELLO	10:52	TORINO P.NUOVA	11:00	0:07	NODI Standard		DIURNO	MAR-VEN	13,030	2,780

Figure 2: Input-Output areas

1. There are 4 drop-down lists to select the service and the Segment:
  - a. **Tipo treno (Type of service):** select the type of service;
  - b. **Segmento 1 (Segment 1):** select the I Level Segment;
  - c. **Segmento 2 (Segment 2) [optional]:** the cell is auto-filled by the software, but it's possible to select manually the II Level Segment;
  - d. **Anno (Year):** select the year of the analysis.



2. There are the technical data of the train:
  - a. **Massa treno [t] (Mass [t]):** type manually the mass of the rolling stock, in tons;
  - b. **Categoria Massa Assiale (Axial Mass Category):** select axial mass category from a drop-down list;
  - c. **Velocità di marcia [km/h] (Speed [km/h]):** this cell is auto-filled by the software once defined the routing and the departure and arrival time. It's an average speed between the Origin and the Destination according to the selected times;
  - d. **Tipo di trazione (Traction System):** select the traction system;
  - e. **Direzione (Direction):** this cell is auto-filled by the software once defined the routing.
3. It calculates the different parts of Component A and the total A-charge;
4. The button shows the screen to define the *routing*;
5. The area is filled by the *routing* defined above and by the different B charge for each section in the specific time period;
6. It calculates the Component B and the total B-charge;
7. It shows the Origin and the Destination, the departure and arrival time and the running time, and, finally, the Total Charge as sum of the Components A and B and the Average Charge on the whole path.



## 2. SEGMENT AND YEAR DEFINITION

	Tipo treno
	Segmento1
	Segmento2
	Anno

Figure 3: Segment and Year definition screen

Click the cell “*Tipo treno*” and choose, from a drop-down list, the type of service between:

- **Treno viaggiatori (*Passenger Train*)**;
- **Treno merci (*Freight Train*)**;
- **Treno tecnico (*Other Train*)**: not passenger nor freight train.

Once defined the type of service, click the cell “*Segmento 1*” and choose, from a drop-down list, the I Level Segment related to the type of service [Figure 4]

Treno viaggiatori	Tipo treno
▼	Segmento1
Premium	Segmento2
Basic	
OSP-LP	
Regio	

**a**

Treno merci	Tipo treno
▼	Segmento1
Merci	Segmento2

**b**

Treno tecnico	Tipo treno
▼	Segmento1
Tecnici	Segmento2

**c**

Figure 4: I Level Segment

Once defined the I Level Segment, it’s possible to select the related II Level Segment in the cell “*Segmento 2*”.

**This cell is auto-filled once defined the routing.**

2025	Anno
▼	
2025	
2026	
2027	
2028	

Figure 5: Year selection

Click the cell “*Anno*” and select simulation year.



### 3. ROLLING STOCK CHARACTERISTICS

	Massa treno [t]	
	Categoria Massa Assiale	
	Velocità di marcia [km/h]	
	Tipo di trazione	
	Direzione	

Figure 6: Technical Characteristic Definition

Click the cell “*Massa treno [t]*” and type the total mass of the rolling stock in tons.

Click the cell “*Categoria Massa Assiale*” and select, from a drop-down list, the axial mass (as Total Mass/n° axis) between the options:

- $\leq 18$  t/a
- $> 18$  t/a

Figure 7: Axial Mass Selection

The cell “*Velocità di marcia [km/h]*” is autofilled once defined the *routing*.

Click the cell “*Tipo di trazione*” and select, from a drop-down list, the traction system:

- ELETTRICA (*Electric Traction*)
- ELETTRICA (2P) (*Electric Traction with 2 pantographs*)
- NON ELETTRICA (*Not-Electric Traction*)

Figure 8: Tipo di trazione

The cell “*Direzione*” is auto-filled once defined the *routing*.



#### 4. COMPONENT A CALCULATION

$T_{A1-2}$	$T_{A3}$	$T_{flat}$	$T_A$ [€/Km]	PEDAGGIO <sub>A</sub> [€]

Figure 9: Component A Calculation

The software calculates the different parts of the Component A:

- $T_{A1-2}$ : component related to the speed class and to the axial mass;
- $T_{A3}$ : component related to the traction system;
- $T_{flat}$ : flat component related to the signaling system.

In cell “ $T_A$  [€/km]” the sum of the 3 components is shown.

In cell “Pedaggio<sub>A</sub> [€]” the product between the component  $T_A$  and the kilometers from routing is show, giving the total A-charge.

#### 5. COMPONENT B CALCULATION

Treno viaggiatori	Tipo treno	Massa treno [t]	499	$T_{A1-2}$	$T_{A3}$	$T_{flat}$	$T_A$ [€/Km]	PEDAGGIO <sub>A</sub> [€]		
Premium	Segmento1	Categoria Massa Assiale	>18t/a	0,000590	0,398	0,130	0,822	0,00 €		
Mono Hub	Segmento2	Velocità di marcia [km/h]	0	0,294						
2025	Anno	Tipo di trazione	ELETTRICA							
Ricerca		Direzione	PARI							
Origine	Par	Destinazione	Arr	Tempo	PEDAGGIO [€]	IMU [€/km]	km	$T_B$ [€/Km]	PEDAGGIO <sub>B</sub> [€]	
							0,000	0,000	0,00 €	
Da località	Par	A località	Arr	Tempo	Tipo rete	Prestan te	Periodo	Giorno	km	$T_B$ [€/Km]

Figure 10: “Ricerca” button





Push the button “*Ricerca*” (“*Search*”): the routing-screen will appear [Figure 11].

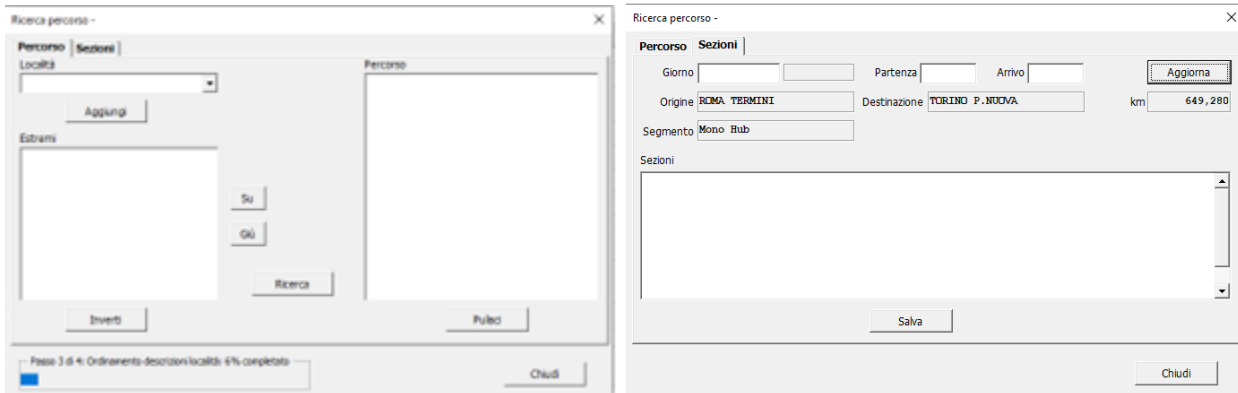


Figure 11: Routing Definition Screen

There are 2 sheets [Figure 11]:

- ***Percorso (Path)***: define Origin, Destination and Transit Localities to define the path;
- ***Sezioni (Sections)***: define the day of the train and the departure and arrival time. The software will divide the path according to the Type of Network and then according to the time.

**At every startup, wait for data loading (the progress bar is shown in the bottom left corner [Figure 12]).**

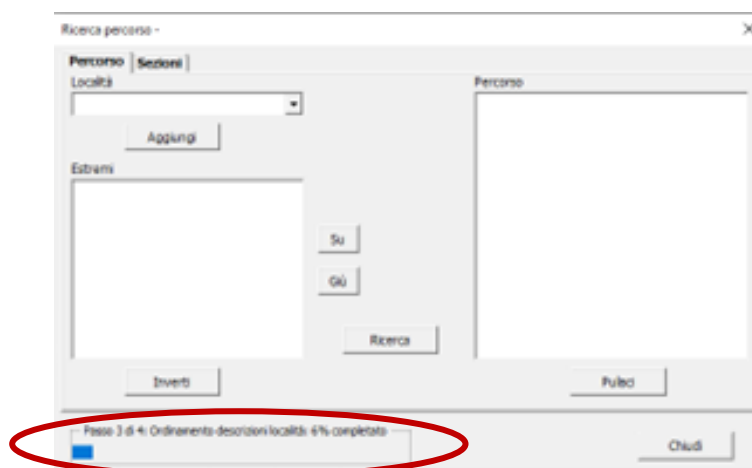


Figure 12: Progress Bar



In the sheet “*Percorso*”, click in the bar “*Località*” (“*Localities*”) and select the localities from a drop-down list or type manually the name (1).

Once found the locality, push the button “*Aggiungi*” (“*Add*”) or, alternately, press the ENTER key on the keyboard (2): the locality will be added in the box below (3) [Figure 13].

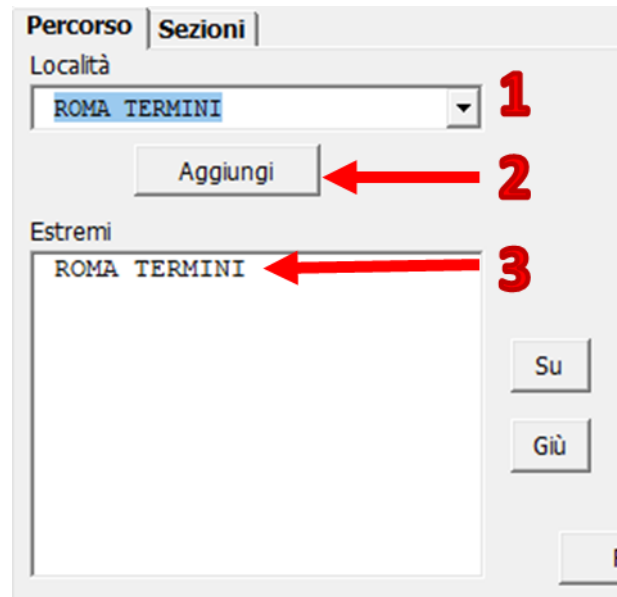


Figure 13: Locality Adding

Add the Origin and the Destination and, between them, all the localities useful to correctly define the path.

Click either the button “*Su*” (“*Up*”) or the button “*Giù*” (“*Down*”) to move a locality one position up or down.

**WARNING: put the different localities in the correct order: the Origin must be in the first place above while the Destination must be at the last place below (example in Figure 14).**

**Click two times with the left mouse button a locality to delete it.**



**Percorso** | **Sezioni**

Località  
ROMA TERMINI

Aggiungi

Estremi

ROMA TERMINI	Origin
CIVITAVECCHIA	Transit
GENOVA BRIGNOLE	Transit
TORINO P.NUOVA	Destination

Su

Giù

R

Figure 14: Locality Adding - Example

Push the button “*Inverti*” (“*Reverse*”) to reverse a path that was realized (from the previous example, the button “*Inverti*” gives the result shown in Figure 15)

**Percorso** | **Sezioni**

Località  
ROMA TERMINI

Aggiungi

Estremi

ROMA TERMINI	Origin
CIVITAVECCHIA	Transit
GENOVA BRIGNOLE	Transit
TORINO P.NUOVA	Destination

Su

Giù

R

**Inverti**

→

**Percorso** | **Sezioni**

Località  
ROMA TERMINI

Aggiungi

Estremi

TORINO P.NUOVA	Origin
GENOVA BRIGNOLE	Transit
CIVITAVECCHIA	Transit
ROMA TERMINI	Destination

Su

Giù

R

**Inverti**

Figure 15: Button “*Inverti*” - Example



Once added all the localities in the correct order, push the button “*Ricerca*” (“*Search*”) **(1)**: the software will generate the path through the localities; the path is shown in the box on the right **(2)**. The scroll bar allows to see the path.

Push the button “*Pulisci*” (“*Clear*”) to clear the box.

An example is shown in Figure 16.

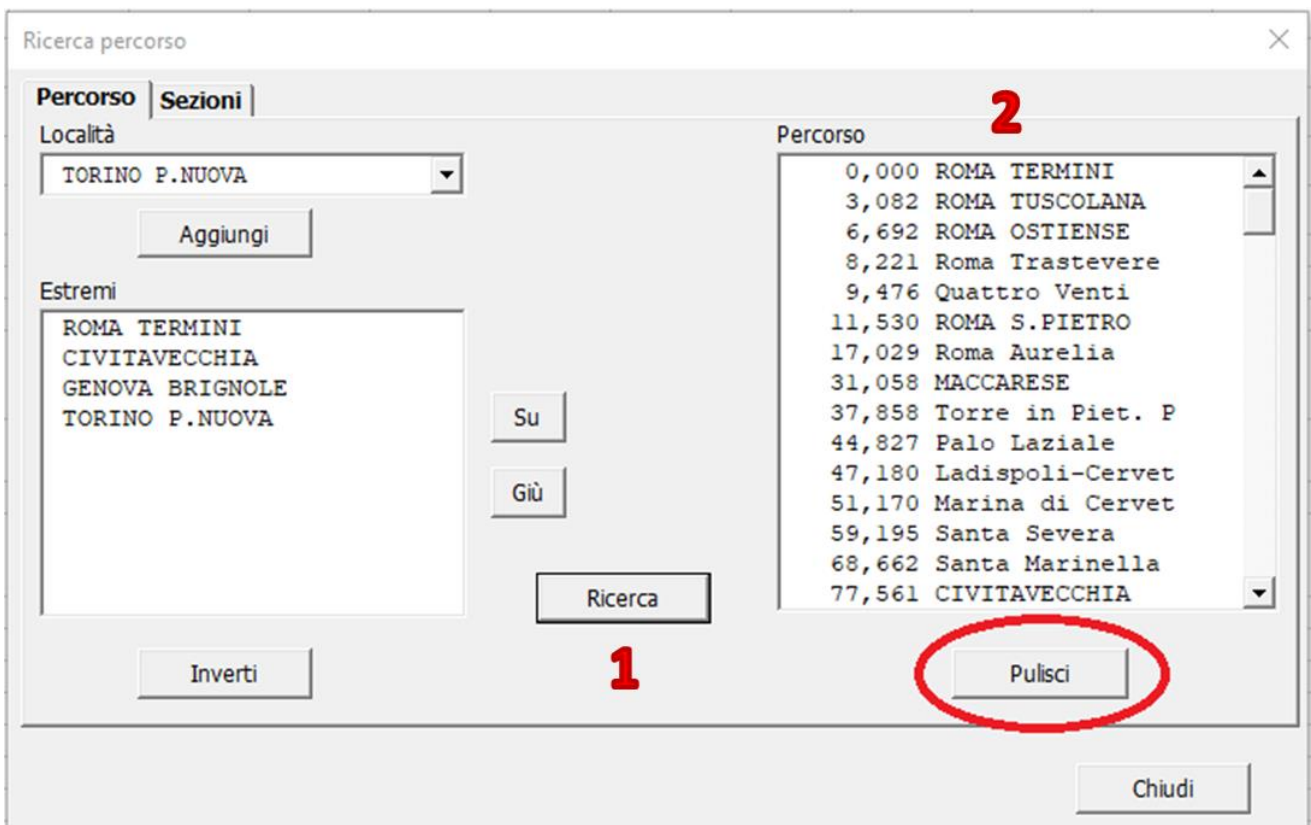


Figure 16: Path Search

Once defined the path, click the button “*Sezioni*” in the top left corner.



The screen in Figure 17 will appear: Origin, Destination and the kilometers between them are already shown.

Figure 17: Screen "Sezioni"

Click in the bar “*Giorno*” (“*Day*”) and type the date of the train in the format of ***DD/MM/YYYY*** (the slashes “/” are typed automatically). The software will show the daily period of the train in the lateral box.

Click in the bar “*Partenza*” (“*Departure Time*”) and type the departure time from the Origin in the format of ***hh:mm*** (the division hour-minutes is automatic).

Click in the bar “*Arrivo*” (“*Arrival Time*”) and type the arrival time in the Destination in the format of ***hh:mm*** (the division hour-minutes is automatic).

**To delete the day or a time, select the whole text in the cell and push the BACKSPACE key on the keyboard.**



Push the button “*Aggiorna*” (“*Update*”) and the II Level Segment will be defined. The software will split the path [Figure 18]:

- The path is split for Type of Network, **NOT for section name;**
- A single Type of Network is split according to the category DIURNO (“*DAY*”) or NOTTURNO (“*NIGHT*”);
- A single Type of Network is split finally according to the daily period.

**The software automatically defines the passage from DAY to NIGHT and the date change.**

Ricerca percorso - ✕

**Percorso** | **Sezioni**

Giorno:   Partenza:  Arrivo:

Origine:  Destinazione:  km:

Segmento:

Sezioni

ROMA TERMINI	05:00	ROMA TUSCOLANA	05:01	NODI Core	NOTTURNO	MAR-VEN
ROMA TUSCOLANA	05:01	MACCARESE	05:17	NODI Standard	NOTTURNO	MAR-VEN
MACCARESE	05:17	Montalto di Cas.	06:02	FOND Standard	NOTTURNO	MAR-VEN
Montalto di Cas.	06:02	PISA/bin. Pisa C	08:02	FOND Standard	DIURNO	MAR-VEN
PISA/bin. Pisa C	08:02	Dev Lucca/Spezia	08:03	COMPL Standard	DIURNO	MAR-VEN
Dev Lucca/Spezia	08:03	Genova Nervi	09:25	FOND Standard	DIURNO	MAR-VEN
Genova Nervi	09:25	Mignanego	09:41	NODI Base	DIURNO	MAR-VEN
Mignanego	09:41	ARQUATA SCRIVIA	09:51	FOND Standard	DIURNO	MAR-VEN
ARQUATA SCRIVIA	09:51	AL Cavalcavia	10:09	FOND Top	DIURNO	MAR-VEN
AL Cavalcavia	10:09	ALESSANDRIA	10:10	FOND Standard	DIURNO	MAR-VEN

Figure 18: Routing



Push the button “*Salva*” (“*Save*”) and the path will be loaded in the home screen, showing, for each section, the kilometers and the related Component B [Figure 19].

Da località	Par	A località	Arr	Tempo	Tipo rete	Prestante	Periodo	Giorno	km	T <sub>B</sub> [€/Km]
ROMA TERMINI	5:00	ROMA TUSCOLANA	5:01	0:01	NODI Core		NOTTURNO	MAR-VEN	3,082	2,780
ROMA TUSCOLANA	5:01	MACCARESE	5:17	0:15	NODI Standard		NOTTURNO	MAR-VEN	27,976	1,390
MACCARESE	5:17	Montalto di Cas.	6:02	0:45	FOND Standard		NOTTURNO	MAR-VEN	81,766	1,390
Montalto di Cas.	6:02	PISA/bin. Pisa C	8:02	2:00	FOND Standard		DIURNO	MAR-VEN	216,467	2,780
PISA/bin. Pisa C	8:02	Dev Lucca/Spezia	8:03	0:01	COMPL Standard		DIURNO	MAR-VEN	1,794	1,946
Dev Lucca/Spezia	8:03	Genova Nervi	9:25	1:22	FOND Standard		DIURNO	MAR-VEN	148,583	2,780
Genova Nervi	9:25	Mignanego	9:41	0:15	NODI Base		DIURNO	MAR-VEN	27,201	2,502
Mignanego	9:41	ARQUATA SCRIVIA	9:51	0:10	FOND Standard		DIURNO	MAR-VEN	19,280	2,780
ARQUATA SCRIVIA	9:51	AL Cavalcavia	10:09	0:18	FOND Top		DIURNO	MAR-VEN	32,508	3,058
AL Cavalcavia	10:09	ALESSANDRIA	10:10	0:00	FOND Standard		DIURNO	MAR-VEN	0,548	2,780
ALESSANDRIA	10:10	TROFARELLO	10:52	0:42	FOND Top		DIURNO	MAR-VEN	77,045	3,058
TROFARELLO	10:52	TORINO P.NUOVA	11:00	0:07	NODI Standard		DIURNO	MAR-VEN	13,030	2,780

Figure 19: Routing and Component B

The software will calculate automatically the total Component B as the distance-weighted average and, then, it will calculate the total B-charge (*Pedaggio<sub>B</sub>*) [Figure 20].

km	T <sub>B</sub> [€/Km]	PEDAGGIO <sub>B</sub> [€]
649,280	2,611	1.695,01 €

Figure 20: Component B Calculation



## 6. TOTAL AVERAGE CHARGE CALCULATION

The software shows the data of the train (to calculate the speed as defined in Chapter 4 and the Component A) and sum the Components A and B, giving the Total Charge (*Pedaggio*).

The software calculates the Total Average Charge (*IMU*) dividing the Total Charge for the total distance [Figure 21].

Origine	Par	Destinazione	Arr	Tempo	PEDAGGIO [€]	IMU [€/km]
ROMA TERMINI	5:00	TORINO P.NUOVA	11:00	6:00	2.434,42 €	3,75 €

Figure 21: Total Charge and Total Average Charge