Pricing Simulator Manual

Ver. 1 - 29/02/2024

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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_{flat}	T_A [€/Km]	PEDAGGIO$_A$ [€]
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	ELETTRICA						
2025	Anno		Direzione	PARI						
Ricerca										

Origine	Par	Destinazione	Arr	Tempo	PEDAGGIO [€]	IMU [€/km]		km	T_B [€/Km]	PEDAGGIO$_B$ [€]
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	Presta nte	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.

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

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]

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*.

Figure 5: Year selection

Click the cell *"Anno"* and select simulation year.

3. ROLLING STOCK CHARACTERISTICS

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:

- ≤ 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$_A$ [€]

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$_A$ [€]*" the product between the component T_A and the kilometers from *routing* is show, giving the total A-charge.

5. COMPONENT B CALCULATION

Figure 10: "Ricerca" button

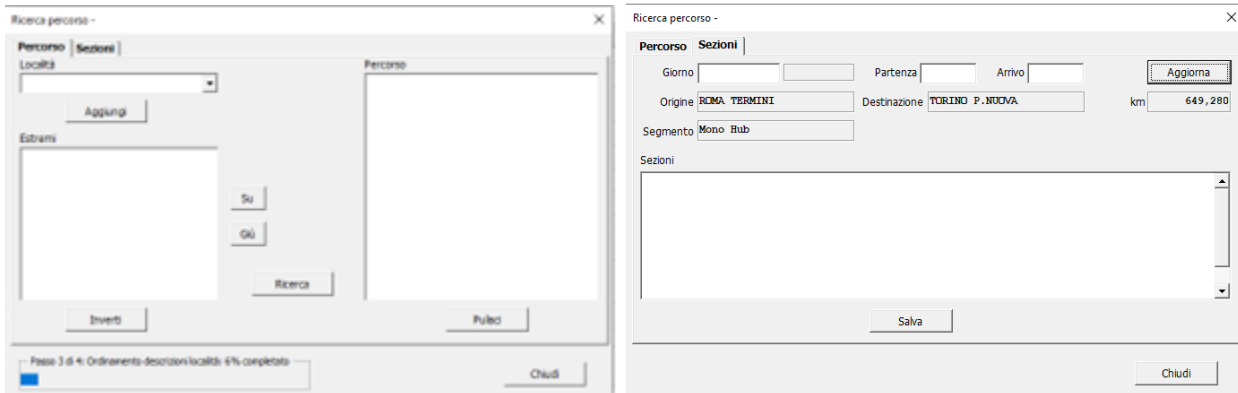Push the button "*Ricerca*" *("Search")*: the routing-screen will appear [Figure 11].

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]).
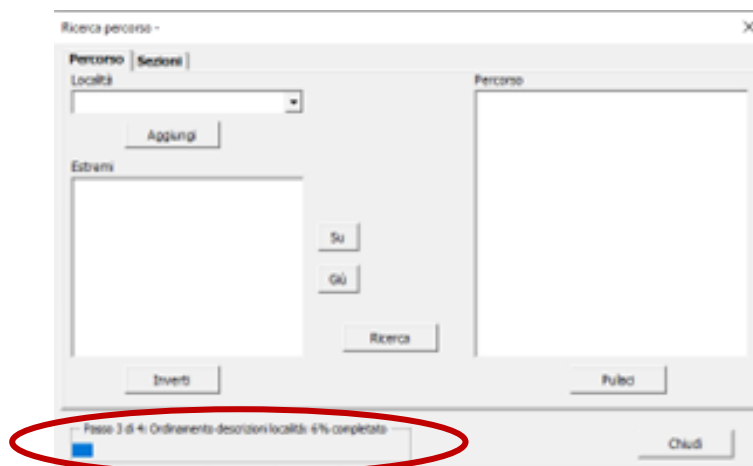

Figure 12: Progress Bar

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].
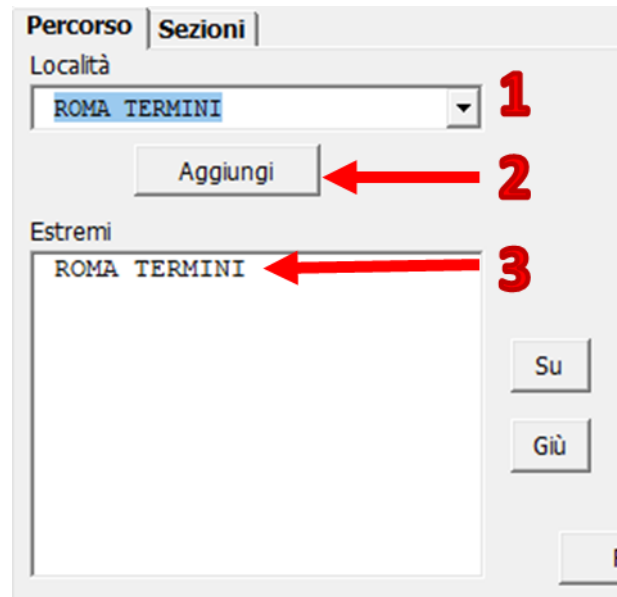

Figure 13: Locality Adding

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.

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)

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.
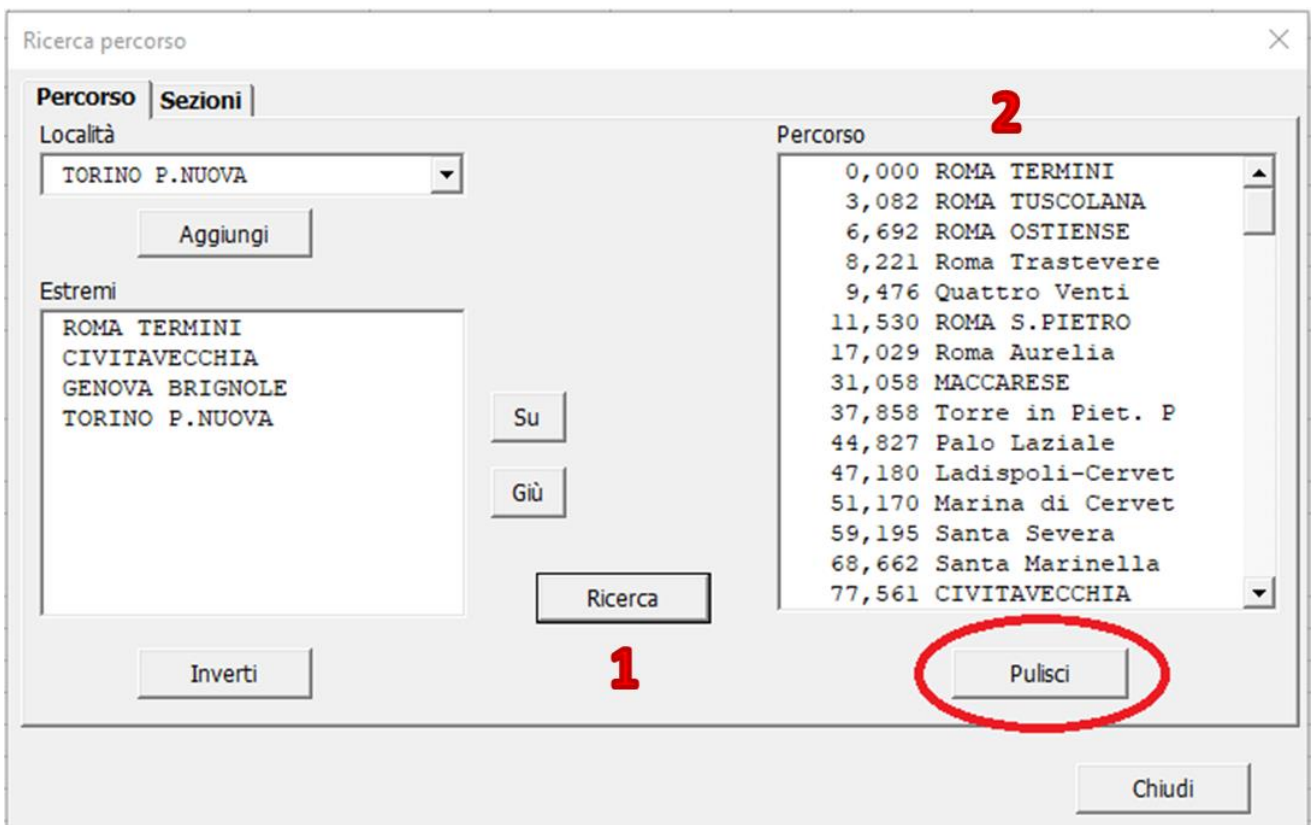
An example is shown in Figure 16.

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 chilometers 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.

Figure 18: Routing

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

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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$_B$)* [Figure 20].

km	T_B [€/Km]	PEDAGGIO$_B$ [€]
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 Averge Charge *(IMU)* diving 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