TrainCad uses three file formats: .lot (layout files), .frm (frame files) and .trk (track libraries). They can all be edited in any plain text editor, like Notepad. But please pay attention to some command lines which should not be modified, as you can read in the "File formats" section inside the TrainCad Help files.

TrainCad does not support pre-made drawings other than the tracks themselves within the track library files. Instead, the frame files can be easily edited, and you can place the desired objects anywhere in your layout work area. And they can be set at ANY coordinate, so you can match the exact location in your desired project.

Frame files contain the coordinates of the frame around the layout, and possible holes inside the layout. The frame is displayed as a guide together with the layout, but has no effect on the drawing of the layout. The frame is described using relative coordinates from the 'current point'.

The format of the .frm file is as follows:

```
M x y
L x y
E
```

The M (moveto) record specifies a starting point in absolute coordinates. The L (lineto) record draws a line from the current point using the relative offsets given. The E record ends the file. It is legal to have several M records, and each will start a new polygon. You can have only one "E" coordinate within a .frm file but it doesn't matter how many "M" or "L" lines you have.

CREATING OBJECTS inside the .frm files

It may look complicated at the beginning, but it is extremely easy to do, especially when you already know the exactly coordinates where you want the object to appear. Those who know the famous "Cobol" - the freak turtle which need an entire command just to draw a line - will recognize the friendly and easy command lines.

TrainCad allows us to work with the three file formats at the same time, but only with one file of each format at the work area. That means that you will not be able to keep open more than one layout or import more than one frame or track library at once. But you can create different files for each format and, when all of them look like your desired sizes and coordinates, just mix them together in one single .trk or .frm file.

Let's take some Frateschi buildings as an example. Maybe you wish to have a suburban house (ref.1513), a passenger platform (ref.1502) and an engine house (ref.1517). Their sizes are as follows:

-platform: 60 x 330 mm;
-house: 101 x 85 mm (including the ground around the house, which comes with the building kit);
-engine house (a.k.a. "garage"): 105 x 205 mm.

I'd suggest that you create a separate file for each object. That way, we'll have a file list as shown bellow:
-platform.frm (this is the suggested file name; Do NOT type it as a command line inside the file)

```
M     0     0

L     0    330
L    60       0
L     0   -330
L   -60       0

E     0       0
```

Note: In this case, the first line tells TrainCad that the building must be placed with the initial point as ZERO, such in the 'x' as in the 'y' axis. The next "L" lines tell the size of the straight line that must be drawn over the 'x' and/or 'y' axis. So, we'll have, first, one 330 mm line pointing "north" (vertical), then a 60 mm straight line pointing "east" (horizontal), then another 330 mm straight line going "south" (negative value, vertical) and, to finally close the shape, another 60 mm straight line pointing to "west" (negative value, horizontal). To inform TrainCad that the file is finished, type in the command line "E", with the values = ZERO in both axis. Does anybody out there see the "Cobol" now? That's what I was talking about.... ;-)

And here comes the rest of the file list:

-house.frm (this is the suggested file name; Do NOT type it as a command line inside the file)

```
M     0     0

L     0     101
L    85       0
L     0    -101
L   -85       0

E    0       0
```

-garage.frm (this is the suggested file name; Do NOT type it as a command line inside the file)

```
M     0     0

L    105    0
L      0   205
L   -105    0
L      0   -205

E     0      0
```

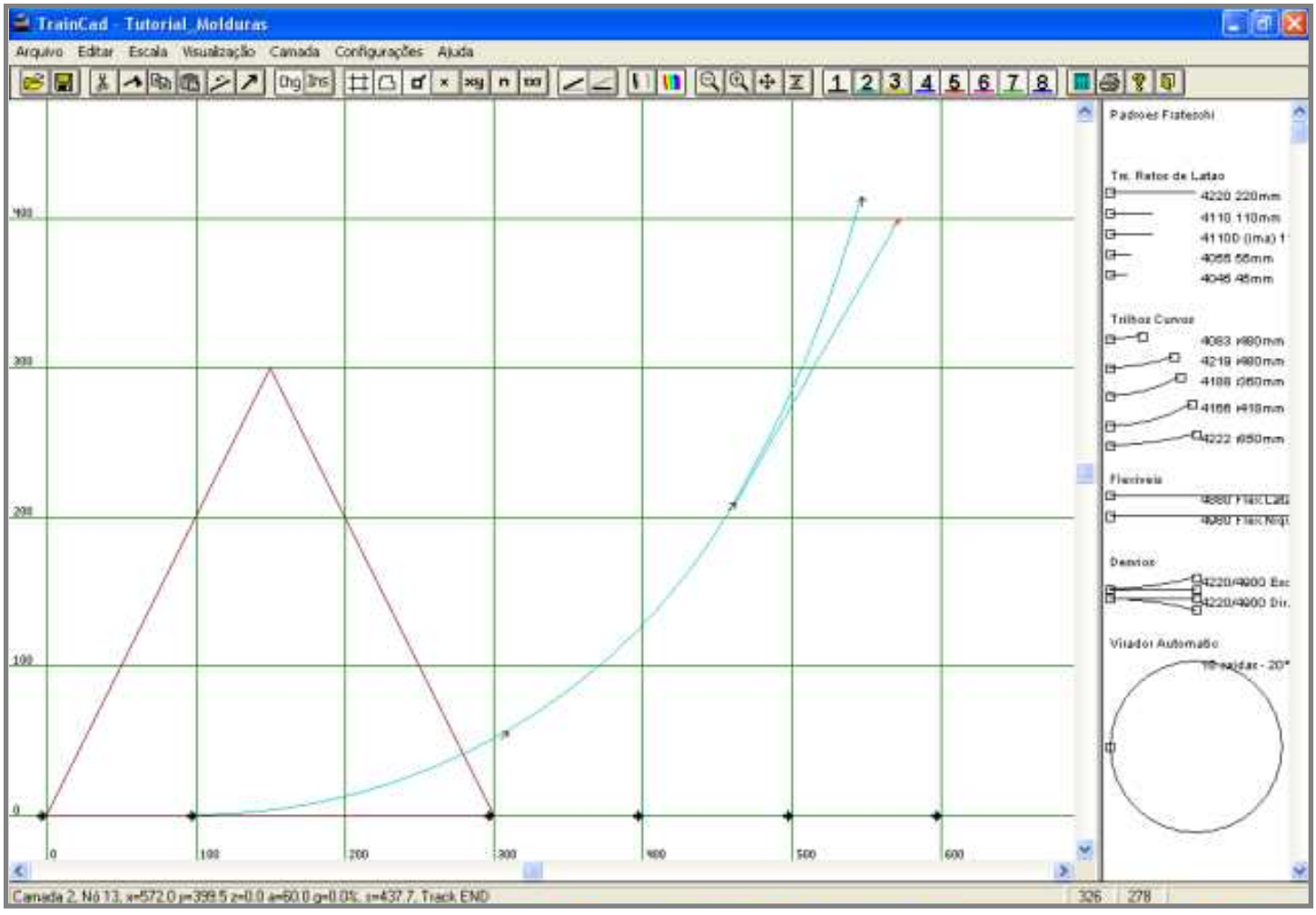
Please note that, in these cases, we're typing one "E" line for each of the files, and so it must be. When we mix them all together in one single .frm file, only one "E" line must be left at the end of the commands, and the previous ones must be erased.

When these three files are done, try each one of them, by creating a new or even using any existing TrainCad layout (File->New or File->Open), and load each of the new .frm files (File->Load frame...) to see if the result is according to your desires. Maybe you don't want an object placed in vertical direction. To change that, you need only to modify the first "L" command line with the 'x' axis value, and vice-versa. If you get caught by doubt about the sizes, just display the Grid at the work area (Settings->Grid). If the dark red lines which represent the frame aren't shown, check if this feature is enabled (Settings->Frame).

Note that, until now, we've created only square or similar type of objects. But TrainCad supports ANY shapes, except for the round ones. Even those buildings that look like a huge "T" when shown from above can be made, like the Frateschi Passenger Station (ref.1519). For example, let's draw a triangle:

```
M      0      0

L     150   300
L     150  -300
L    -300     0

E      0      0
```

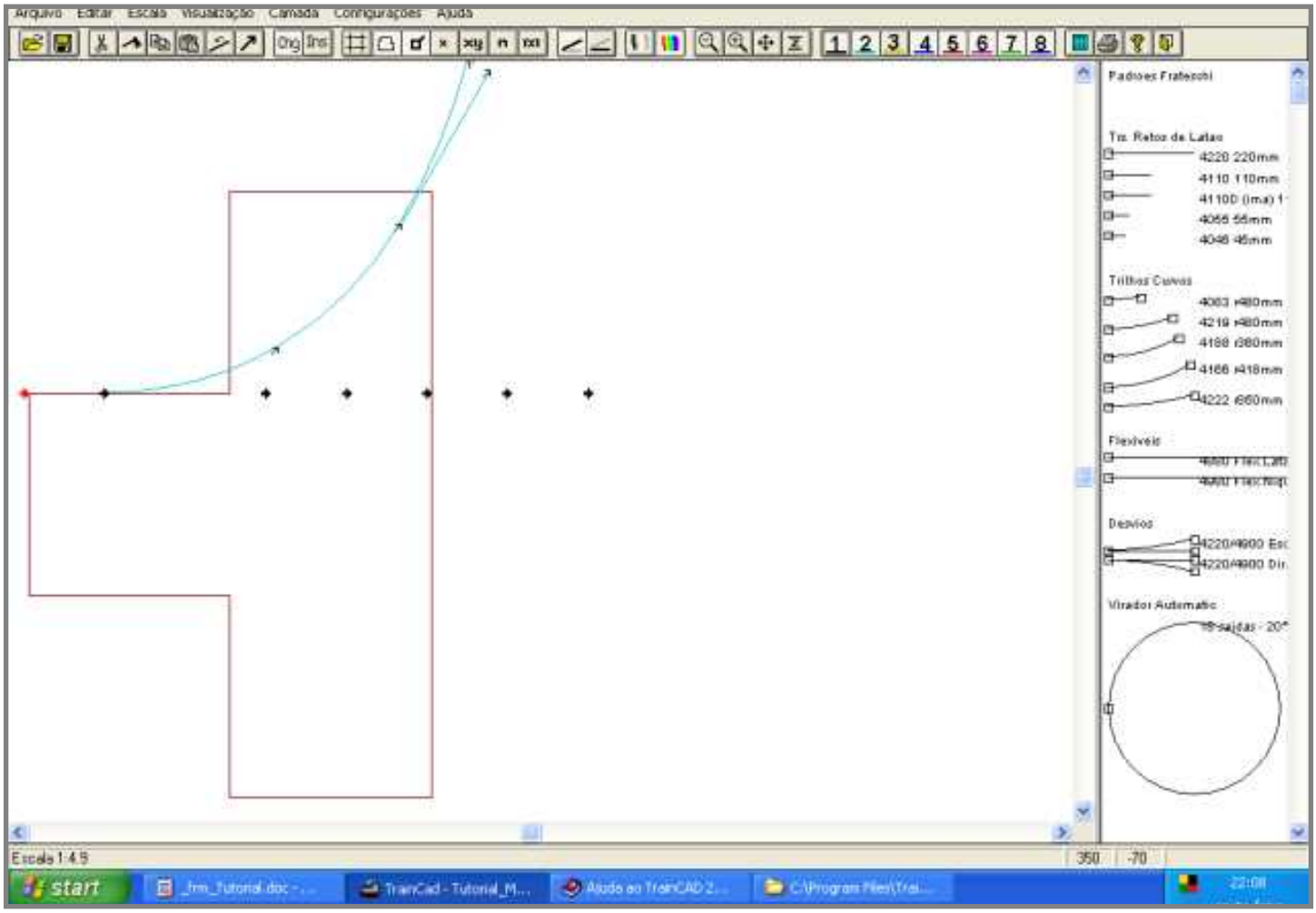
As first value, a sloping straight 300 mm height line will be drawn, "moving" from ZERO to the 150 mm value in the 'x' axis, followed by a similar straight line, but this will point "south". Then, to close the triangle, a straight horizontal 300 mm line will appear, this one pointing "west" due to the negative horizontal value, over to the 'y' axis. If you wish, try different values pointing in any direction to see what happens and enjoy the unlimited potential of TrainCad.



The darkred line displays the new frame loaded.

Remember that each "L" line will start from the point reached at the previous "L" command line, and NOT from the "M" initial point (except, of course, if you're typing the first "L" values....). To understand that, let's try to drawn some kind of "T" shape:

```
M     0     0

L    250     0
L      0     250
L     250    0
L     0     -750
L    -250    0
L     0     250
L    -250     0
L     0     250

E     0       0
```

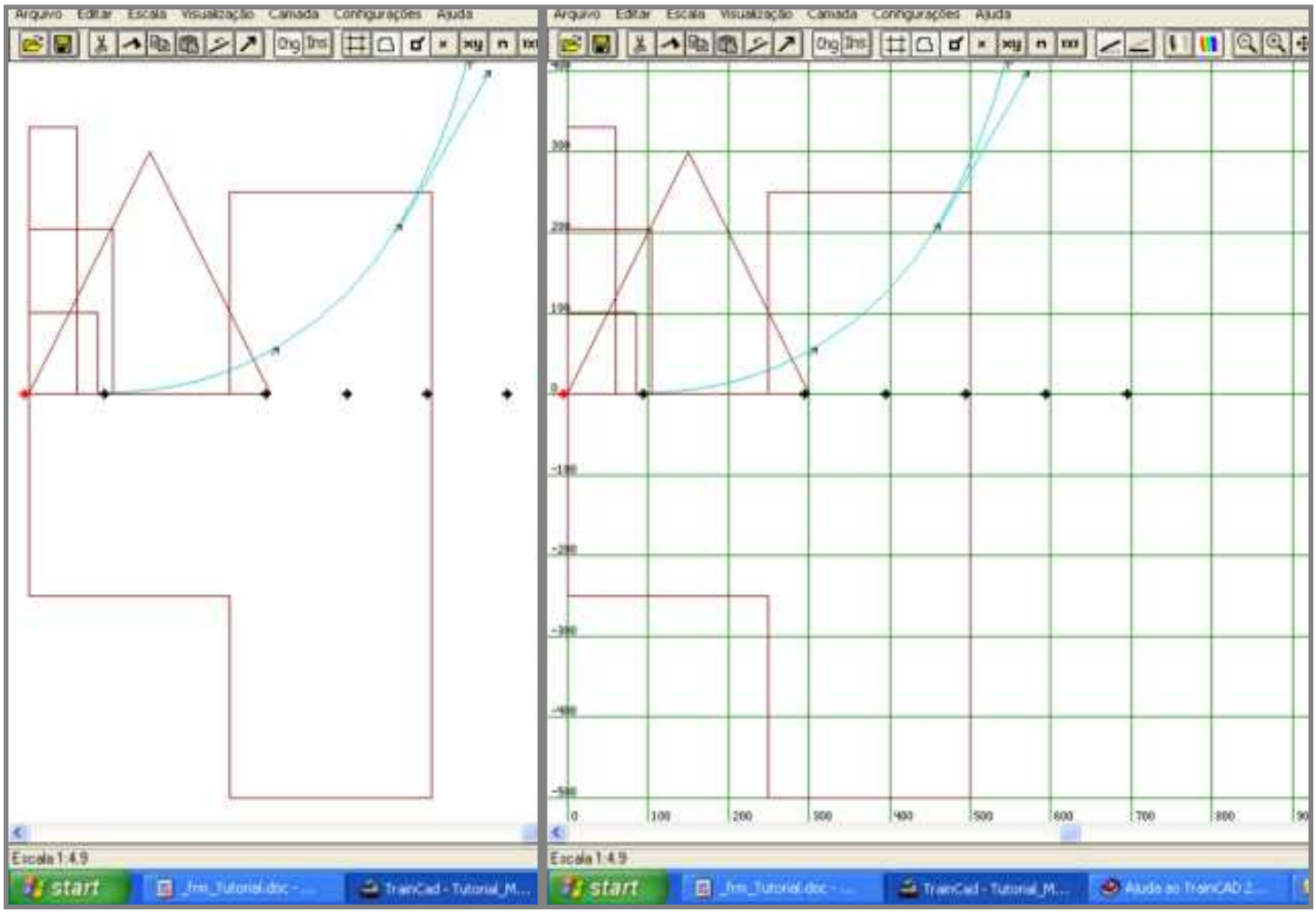


GROUPING VARIOUS OBJECTS inside one single .frm file

Now comes the fun! :-D !
When all tests are made to make sure that you have your desired objects and that they all have the correct measurements, you just need to copy ALL the coordinates to one single text file (when using Notepad, just use "Copy" and "Paste"), and save this new file with a different name. You can also add comments at the end of each "M", "L" or "E" command lines, so you'll easily identify which object will be drawn with those values. Just add a semicolon ";" after the 'x' and 'y' values and type in the name, reference or any text you wish. For example, take a look at what happened when we've pasted all coordinates from the previous five objects, with the appropriate comments:

```
=====================================
- maquete_tutorial.frm (this is the suggested file name; Do NOT type it as a command line inside the file)

M     0     0 ; start for the "T"

L    250     0
L      0     250
L     250    0
L     0     -750 ; the "T" longest part, pointing "south"
L    -250    0
L     0     250
L    -250     0
L     0     250 ; end of "T"

M     0     0; platform begins

L     0    330
L    60       0
L     0   -330
L   -60       0; end of platform

M     0     0; house start

L     0     101
L    85       0
L     0    -101
L   -85       0; house end

m     0     0; start for the triangle

l    150   300; up of the triangle
l    150   -300; bottom right point
l   -300    0; bottom left point and close for the shape

M     0     0; "garage" start

L    105    0
L      0   205
L   -105    0
L     0   -205; end of garage

E     0      0; end of the entire frame file
=====================================
```

After that, save the file and load it in TrainCad, just to see the funny mess that must appear.



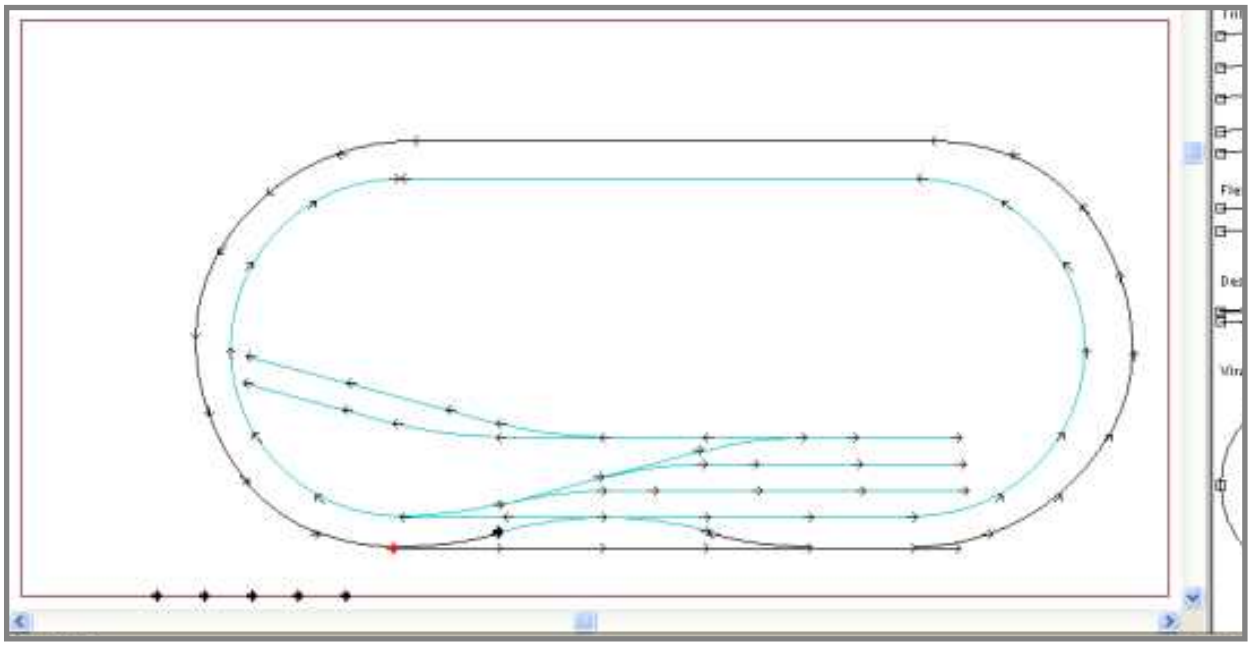
New frame with all the new objects in a mess, waiting for ajustments in the ~M~ command line. The grid is disabled enabled, respectively.

You'll see that the objects will display on top of each other. Don't worry: that doesn't mean that the measurements are necessarily wrong. This kind of mess happens because all the objects have the same "M" values, like the line above:
M 0 0

TrainCad believe that you wish all the buildings at the same point. To place them correctly, just observe what the correct coordinates in your track layout are. At the example below, we have already laid the tracks, and we're using a frame which represents our available table (the grid is disabled to make easy to view the frame).

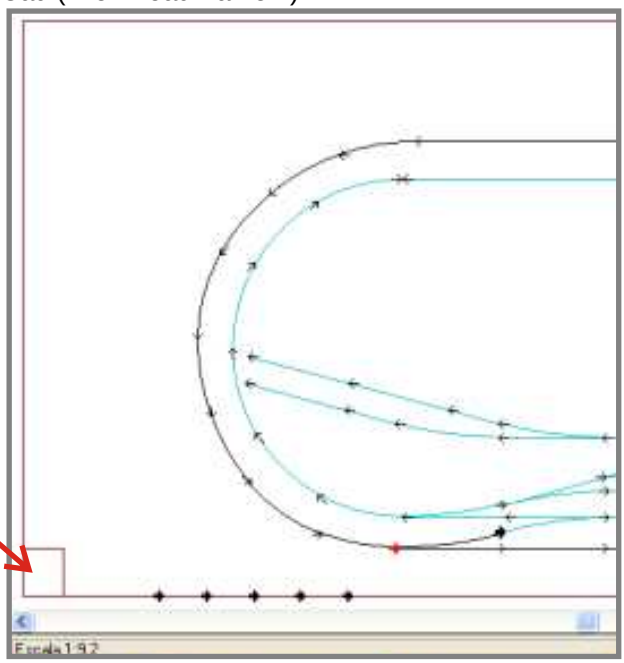
The current frame is the "default.frm", which measurements are as follows:

```
M     0      0
L     0   1220
L  2440      0
L     0  -1220
L -2440      0

E     0      0
```



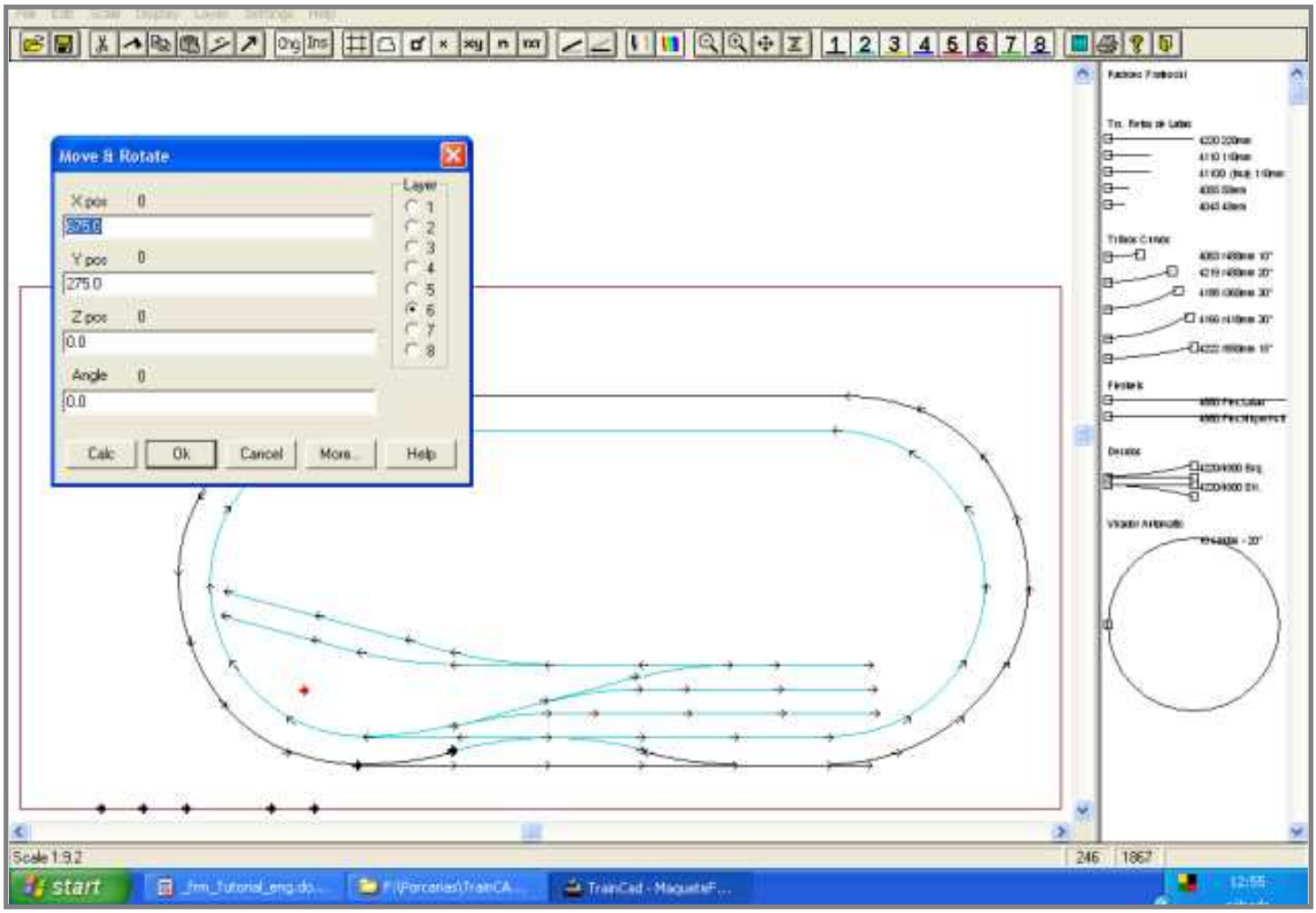
Now, let's add to this file the coordinates for our suburban house, and save this modified file as "table.frm".
Note: this editing CAN be done without closing TrainCad; so you can perform the necessary tests faster. Just save the .frm file from notepad and load it again in TrainCad (File->Load frame...)

```
M     0      0; table start
L     0   1220
L  2440      0
L     0  -1220
L -2440      0;table end

M     0     0; house start

L     0     101
L   85        0
L     0    -101
L  -85        0; house end

E    0        0
```

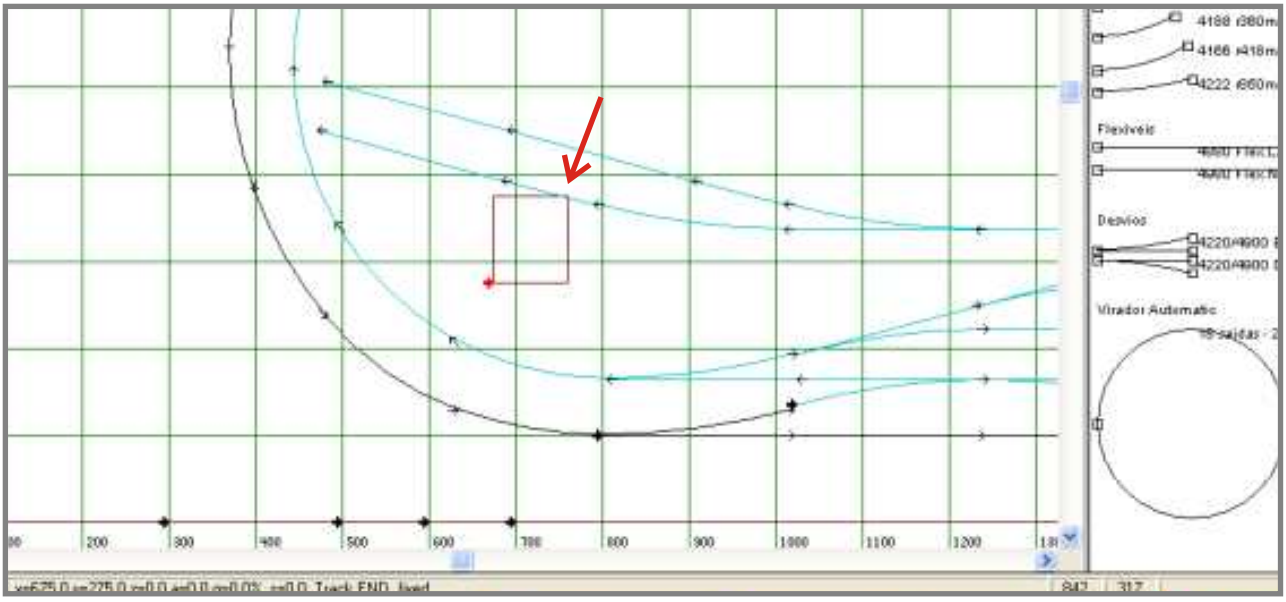


Take a look! A new - but small - object appears in the lower left corner of your work area, due to its twin initial "M" point: ZERO, for 'x' and 'y' axis.
In this project, our model is similar to that which can be found in the Frateschi website (www.frateschi.com.br >>> "Maquete"). We'd like to place the small house near one of the curves of the railroad. So, lets just find out what the correct values for 'x' and 'y' axis are for that point, and transfer those numbers to the "M" command line, inside the "table.frm" file. You can see these coordinates with the help of the Grid (Settings->Grid).

In this case, I'll set the starting point for the house as 675 / 275 (x / y). To test the location before setting the new coordinates in the .frm file, just change the "start-node" values of any layer (Edit->Rotate) that you're not currently using in TrainCad, like shown below:



Ops! Looks like our house was built in a bad place! Consider that it would not be safe to be woken by a train entering our bedroom (but that would be such a cool adventure, indeed!), lets change the initial points a little bit.
ATTENTION! Do NOT change the "L" 'x' and 'y' values; just modify the coordinates for the "M" command line.



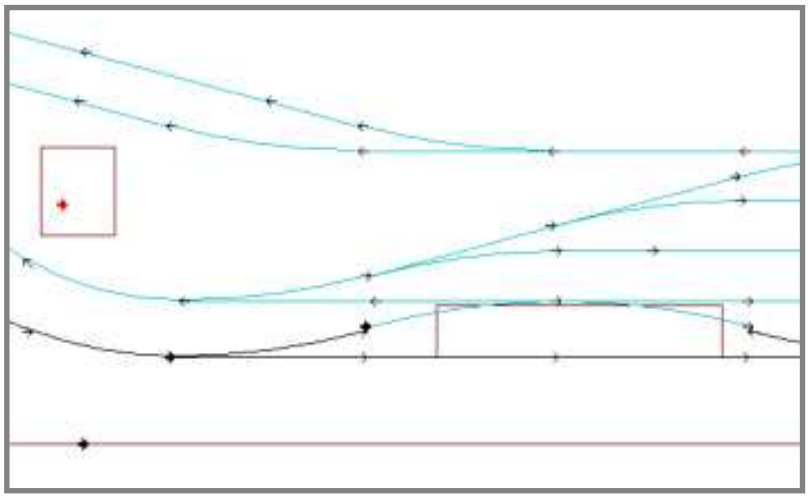
So, we'll have:

```
M     0      0; table
L     0   1220
L  2440      0
L     0  -1220
L -2440      0;table end

M   645     240; house

L     0     101
L    85       0
L     0    -101
L   -85       0; house end

E    0       0
```

And the winner is.... (Note the small red arrow indicating that the starting-node used as a test is in the same place as before, because we've changed only the values within the table.frm file):

Done! Now, just take the same steps to the other buildings you wish! In this example, I've also applied the passenger platform which we've drawn before, between the two tracks:

```
M     0      0; table
L     0   1220
L  2440      0
L     0  -1220
L -2440      0;table end

M   645     240; house

L     0     101
L    85       0
L     0    -101
L   -85       0; house end

M  1100    100; platform start

L   330       0
L     0      60
L  -330       0
L     0     -60; platform end

E    0       0
```



P.S.: if you need to place a building in any other angle (like 15º or 60º), you'll need to calculate the different values to compensate for the "distortion" that will be applied to the object. Just like what was done to draw the triangle. This will demand a little more work.