

# T-Node FR/TS210 Verification Procedure

## Introduction

This procedure is used to verify the accuracy of either a T-Node FR or TS210 temperature string. In this document, T-Node FR and TS210 nodes will generically be referred to as T-Node or node.

## Requirements

1. ID file. The T-Node serial number and Modbus address need to be entered in an ID file. ID file is a .csv file that contains the node serial number and Modbus address separated by a comma, one line per node.

```
<T-Node serial number>,<Modbus address>
```

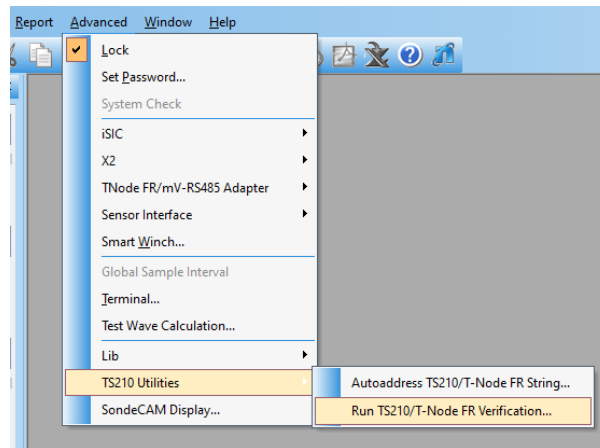
The T-Node serial number can be found engraved in the body of the T-Node itself. The Modbus address, unless requested by the customer, starts at 1 for the first node, 2 for the second node, and so on. NexSens created this file for each order. They are available upon request. Here is an example of a 15 node ID file.

```
7071,1  
7138,2  
7334,3  
7385,4  
7449,5  
7472,6  
7474,7  
7506,8  
7509,9  
7527,10  
7538,11  
7540,12  
7543,13  
7571,14  
7596,15
```

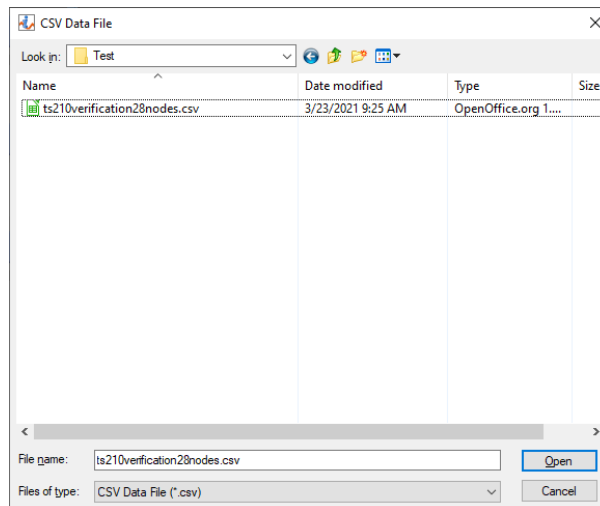
2. iChart 6 software is required to run this verification process. It can be downloaded from NexSens website: <https://www.nexsens.com/support/downloads>
3. A USB to RS485 adapter (NexSens P/N UW-USB-485R) is require to connect the T-Node string to the PC. Alternatively, customer supplied 12V power source (500mA), RS-485 adapter, and a UW flying lead cable (NexSens P/N UW-FL1R) can be used.
4. Reference NIST traceable thermister with +/- 0.05C accuracy or better.
5. Temperature bath (0C to 40C).

# Process

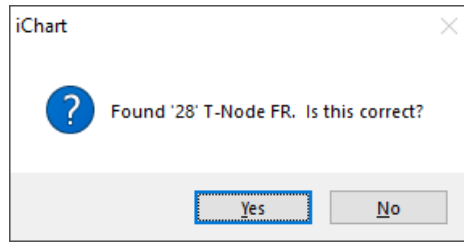
1. Submerge both T-Node string and the reference thermister in the temperature bath. Be sure to space out the nodes to allow water to circulate. **It is important to keep the water circulated throughout this whole process.** We have found that without water circulation, the temperature between nodes could be differ as much as 0.7C.
2. Record the reference thermister make and model and last calibration date on the worksheet.
3. Set the temperature bath to 0C.
4. Open iChart and select "Advanced > TS210 Utilities > Run TS210/T-Node FR Verification..." menu



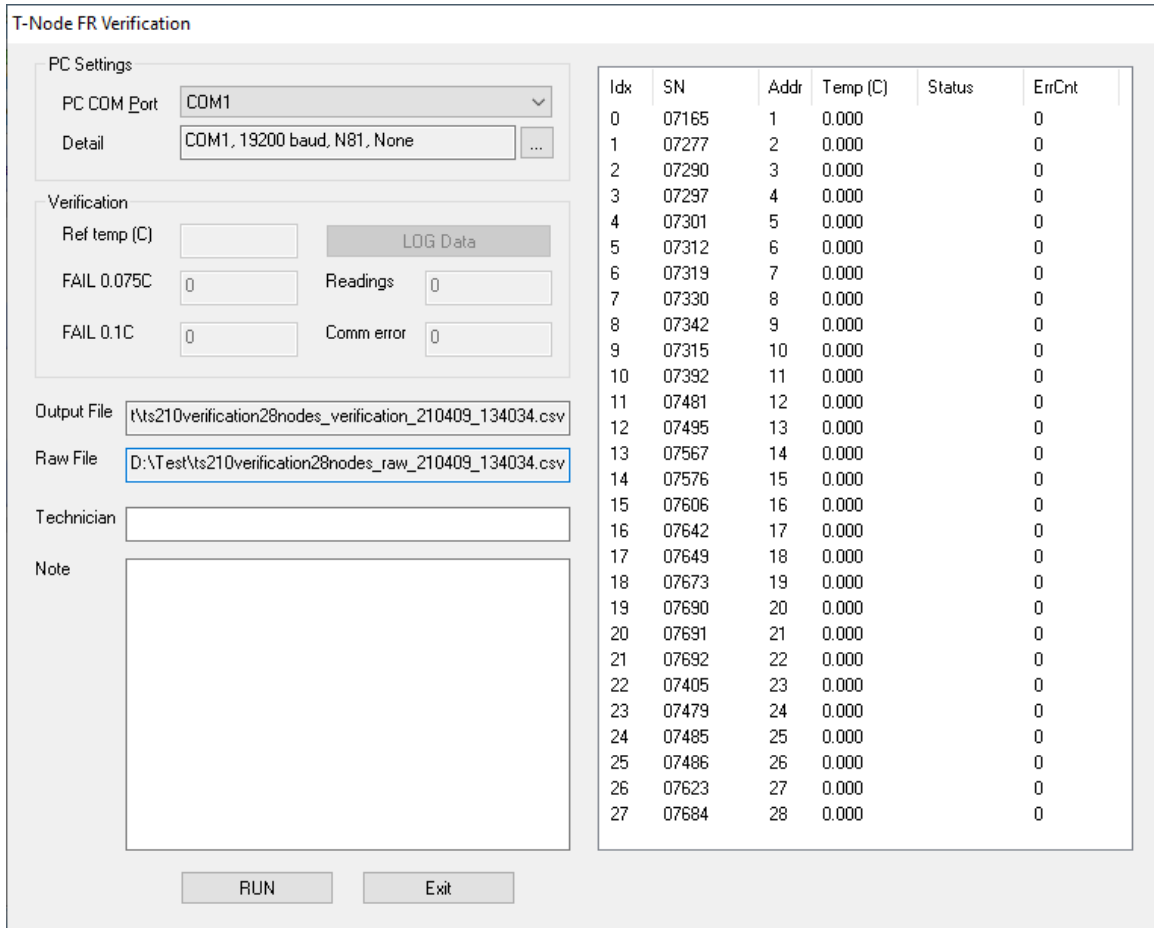
5. Select the T-Node ID file (.csv)



6. Confirm the number of nodes is correct



7. Select the right COM port. The default frame rate should already be correct at 19200 baud, No parity, 8 data bit, 1 stop bit. Of not, click the ". . ." button and pick the correct frame rate.



8. Click **RUN**. Temperature readings of all nodes are saved in the file `_raw_YYMMDD_hhmmss.csv`. The sampling rate is between 3 to 6 seconds depending on the number of nodes.
9. Wait 10 minutes for the temperature of each node reach equilibrium.
10. Enter the reference thermister temperature in the "Ref temp (C)" box then click the "LOG Data" button. This logs both the reference temperature and T-Node string temperature in the output file `_verification_YYMMDD_hhmmss.csv`. It also flags the nodes that are out of spec.

11. Raise the temperature bath to 10C, 20C, 30C, and 40C and repeat steps 10 and 11 for each temperature. These are minimum number of points that need to be verified. More points can be verified if desired.