

PC Control of MTH Engines by Radio Connection to the TIU

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MTH makes the best engines and rolling stock for my railroads of choice, the Pittsburgh & Lake Erie and the Aliquippa & Southern (where my grandfather worked). MTH has many engines and dozen of pieces of rolling stock for these railroads. My layout uses only MTH's DCS.

DCS has been out for almost 15 years. I've been waiting for a way to control my layout using my PC. I've always used Windows PC's so this effort was done originally using XP and more recently Windows 7 and Windows 10.

A few years ago, Mike Hewett presented a PC interface to the tethered mode of operation of DCS. He showed how to sniff out the RS-232 packets running between the Remote and the TIU, how to save those packets and how to later transmit those packets to the TIU from the PC. Mike's methodology was to record the packets sent by the Remote when each key on the Remote was pressed. Without regard to the contents of the packets, he saved them in a file. Then, later, his PC program could read up those saved packets and send them to the TIU. He created a very nice touch screen interface and he could run his DCS trains from his PC. I contacted Mike back then and he sent me copies of his program and I was able to build up his interface to the TIU, sniff out the needed packets and I had a way to control my trains from my PC.

This worked up to a point. When I added a new engine, I had to run the packet sniffer again and pick up the packets needed for the new engine. Mike's program only captured a subset of the many types of commands that could be sent to the TIU. Mike did not read back responses from the TIU or process any of those returned packets. I was looking for something more. I wanted to understand the protocol between the Remote and the TIU.

With a lot of effort, I was able to understand almost all of the communications between the Remote and TIU. I am now able to create packets to control the DCS engines. The packets are complete with correct addressing, command syntax and CRC. I figured this out just by looking at the RS-232 stream over the tether cable. No code disassembly, no logic analyzers, no opening up of Remotes or TIU's. Look at my web page, referenced below, for all of the details.

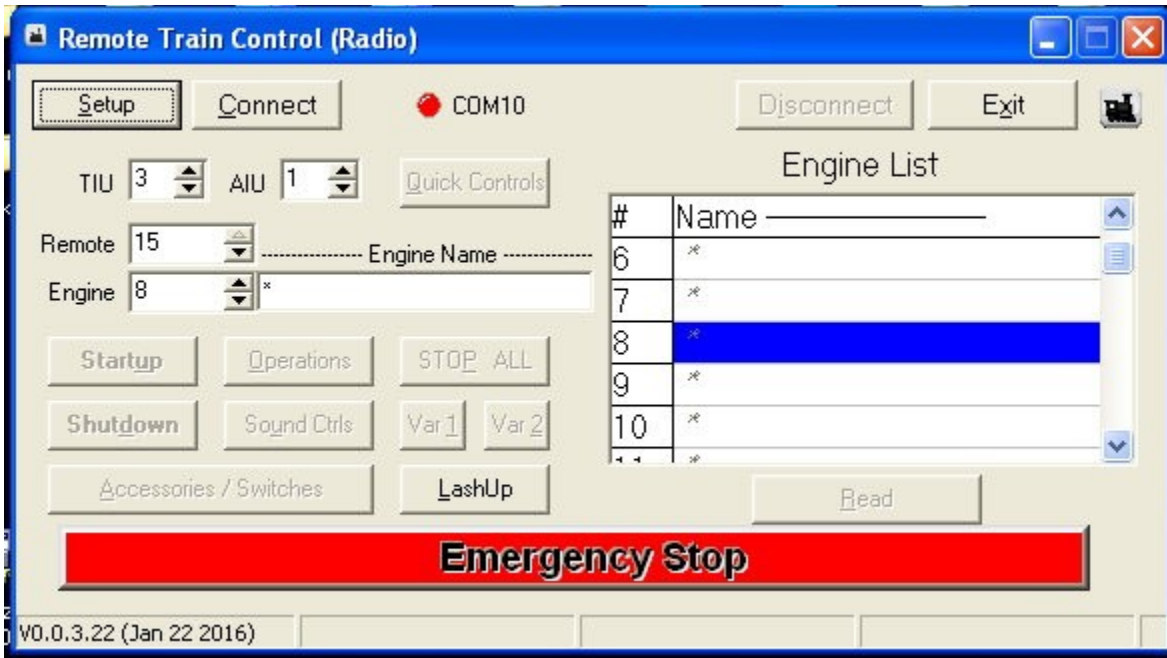
Once I had the RTC program working over the tether cable, I wanted to develop a radio based version. More searching on the Internet turned up the information needed. I found the frequencies used: the Remote transmitted on 916.5 MHz and the TIU transmitted on 905.8 MHz. I was pretty sure that the protocol used was the same as used over the tether cable (it was). About 6 months of effort led to a working radio design.

I could communicate between the PC and the TIU with my Remote Train Control (RTC) program over the radio and run my trains.

How the RTC program works

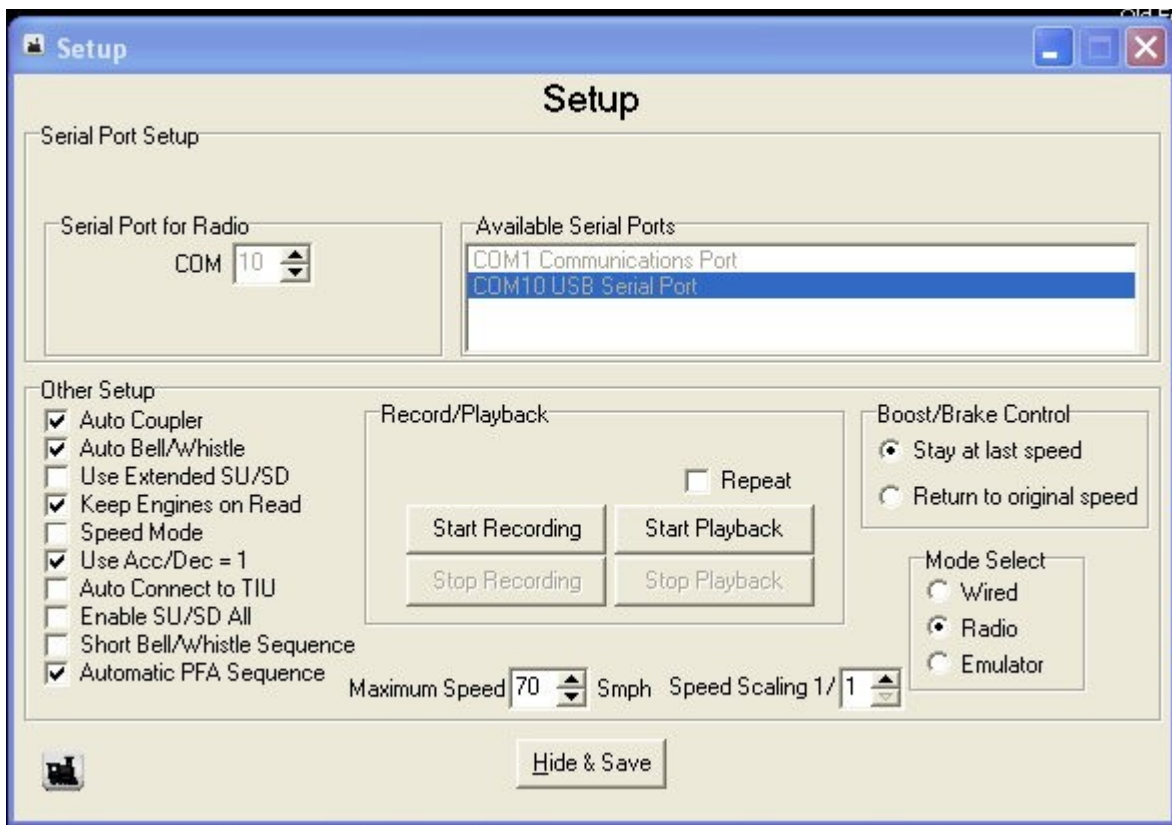
To use the RTC program, you have to build a radio. The RTC web page shows you what you need to do. The radio is based on a set of boards developed by a company called "panStamp". Just requires some soldering. The web page will guide you through downloading the software that you need to program the radio. An alternative, but slightly more expensive version uses an Arduino based design with the same radio. The advantage here is that programming the Arduino is simpler than programming the panStamp. Once you have a radio, you can then download the RTC program from the RTC web page.

Plug the radio into a USB port and start the RTC program. Screen 1 shows the first screen you will see.



Screen 1: Main Screen

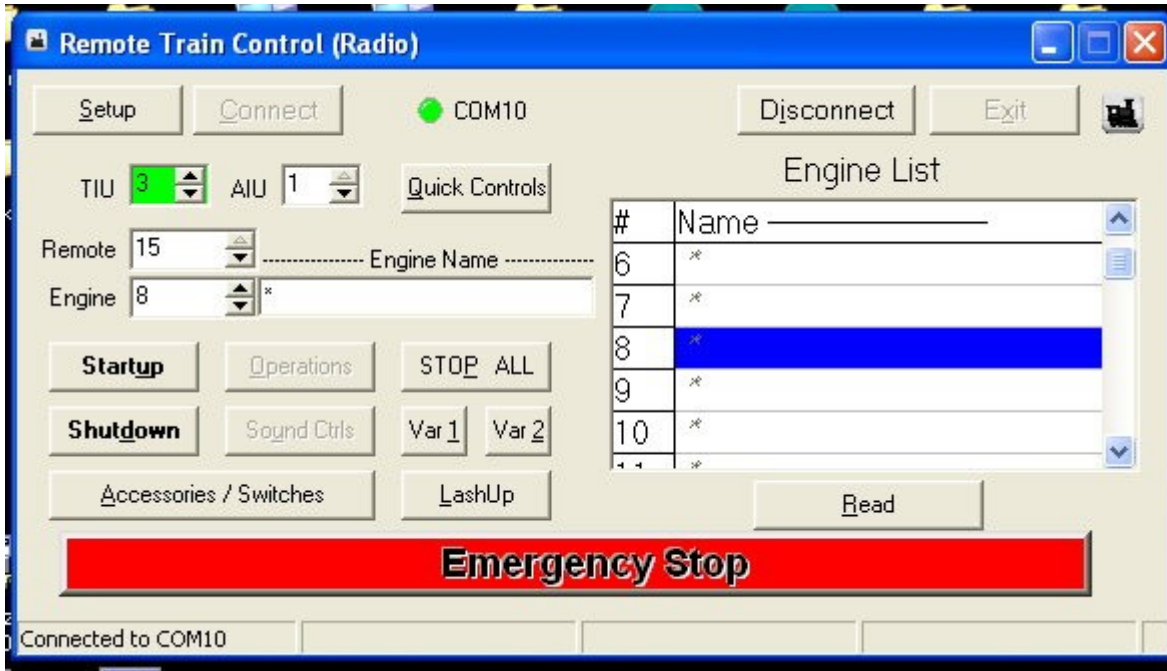
Press the [Setup] button.



Screen 2: Setup Screen

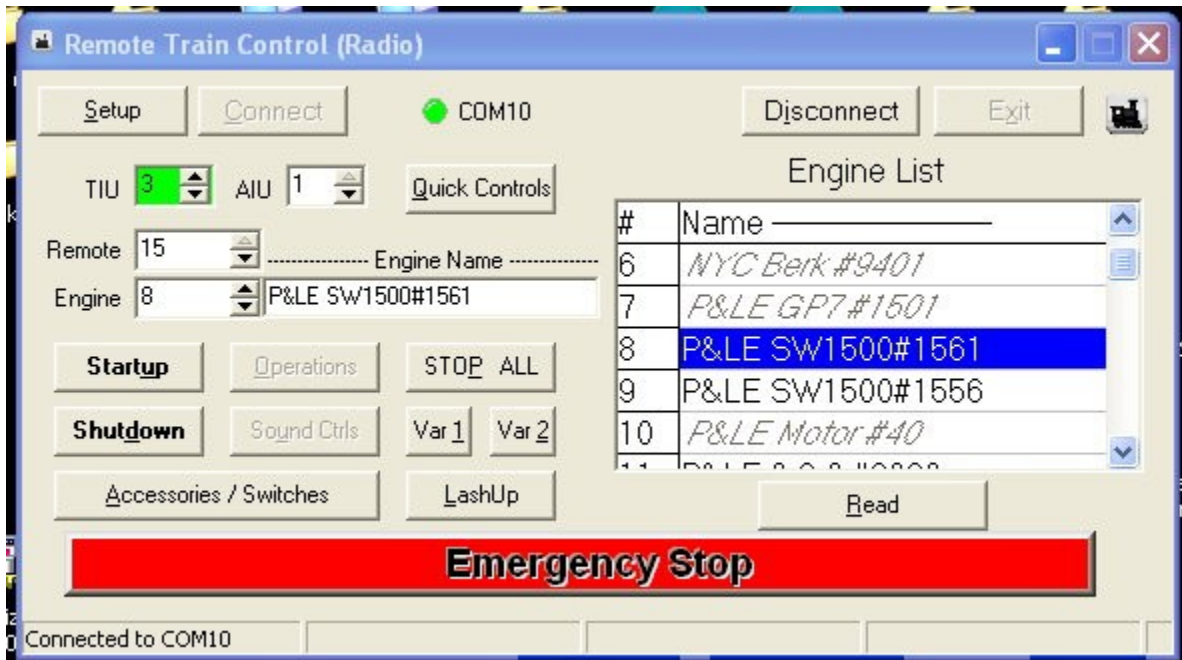
Select the correct serial port, then press [Hide & Save].

Back on the Main screen, press the [Connect] button. The TIU box will turn Green to indicate that the RTC program has successfully connected to the TIU.



Screen 3: Connected to the TIU

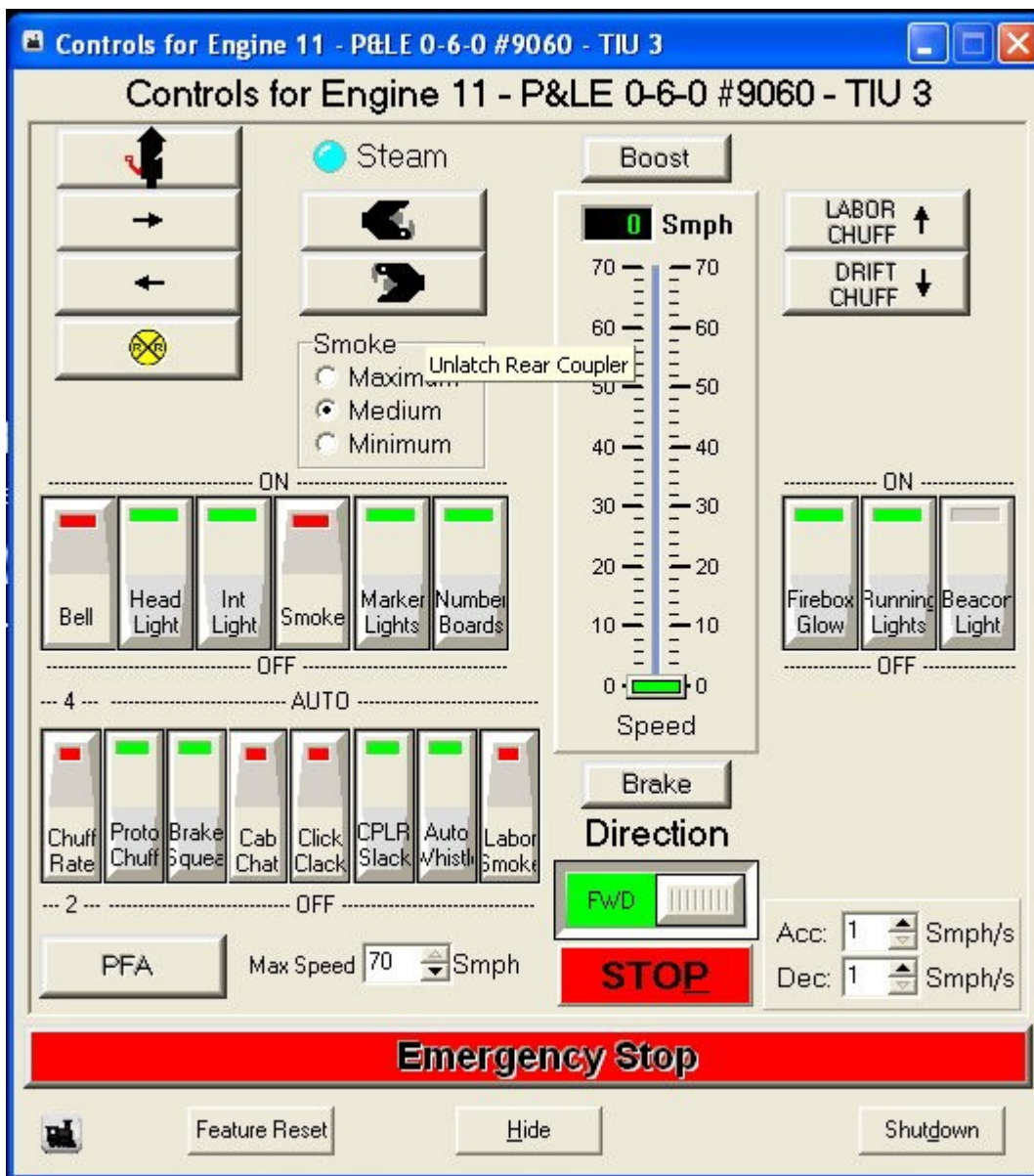
The Engine List is empty. Press the [Read] button to read up the names of every powered engine on your layout. Engines in *Italics* are inactive (either not powered up or are part of a LashUp).



Screen 4: After Reading Up Engine List

Select an engine from the Engine List and press the [Startup] button.

RTC will open an Operations Control Screen (Screen 5).



Screen 5: Operations Screen

This is the main Operations Screen. You can open one of these screens for each started engine or LashUp. From this this screen, you can perform most operations – whistle/horn, uncoupling, lights, speed, smoke, PFA, and labor/drift chuff for steam engines or Rev level sound for diesel engines.

More screens are available for Sound Controls, Conventional Operation, Quick Controls and creation/breakup of LashUps.

To close RTC, press the [Shutdown] button for each started up engine and then on the Main Screen, press [Disconnect] and [Exit].

Getting the RTC Program

You can read the technical details of what I did, view videos of the RTC program and get your own copy of RTC from my web page at http://www.silogic.com/trains/RTC_Running.html . That web page

also has technical information about the program and the interface.

Final Thoughts

My purpose in what I did was to develop a new way to run my trains. I'm not competing with anyone else, especially MTH since they don't have a product for PC control that they sell or give away. I'm not selling anything that I've done. Everything that I have done, I am freely distributing under the GNU Public Licenses.

Writing a program that encompasses every aspect of train operation is not something one person can do alone. Maybe because of that, PC control will never be practicable. It is not possible for me to single-handedly write a program that will satisfy everyone. But I can probably do enough to let enterprising and interested hobbyists have the ability to operate their trains in a different way.