Addendum to The DCS WiFi Companion 1st Edition

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Addendum: TMCC and Legacy

The DCS Remote has the ability to control TMCC engines, or Legacy engines in TMCC mode, provided that any Lionel command base is connected to one of the layout's TIUs. The Premium version of the DCS Application adds the ability to control Legacy engines in full Legacy mode.

The following discussion describes how to use the Premium version of MTH's DCS Application to control TMCC and Legacy engines, connect the required TMCC or Legacy components to a DCS layout, and some considerations regarding the DCS Application's ability to control TMCC and Legacy engines.

1. Adding Control of TMCC or Legacy Engines to DCS

DCS is a two-way data communications system where TIUs send commands consisting of data packets to DCS engines on the center (AC Hot) track rail and listen for acknowledgement data packets from the DCS engine on the outside (AC Common) track rails.

Lionel's Train Master Command Control (TMCC) and Legacy control systems are one-way communications systems that send commands to TMCC or Legacy engines by using the outside track rails as a transmitting radio antenna. Each TMCC or Legacy engine has a receiving antenna to accept commands.

Since these two schemes are very different in this and other ways, DCS and TMCC/Legacy control systems can easily coexist very well on the same layout. This allows O gauge layout operators to have the best of all possible worlds by operating DCS, TMCC and Legacy engines on the same layout.

TMCC or Legacy, when added to a DCS layout, can operate in one of two ways. The first is by using the Lionel TMCC Cab-1 or Legacy Cab-2 remote controls to control TMCC engines and Legacy engines. The second is by using the DCS Application to control TMCC and Legacy engines. Neither method precludes use of the other method.

Note that if it is desired to control Legacy engines, in Legacy mode, from the DCS Application, it is required that a that a Lionel Legacy Command Base and a Lionel SER2 module be installed. Refer to the following section, 2. Controlling Legacy Engines from the DCS Application, for instructions and connection diagrams.

Additional Devices Required for TMCC or Legacy Engine Operation

Since the DCS TIU does not contain the hardware components to communicate directly with a TMCC or Legacy engine, it's necessary that a Lionel TMCC Command Base, Base-1L or Legacy Command Base be added to the layout, regardless of which method of controlling TMCC or Legacy engines is selected.

If the Cab-1, Cab-1L or Cab-2 control method is selected, a Lionel Cab-1, Cab-1L or Cab-2 remote control is required in addition to the TMCC, Base-1L or Legacy Command Base. If the DCS Application control method is selected, an MTH cable is required to connect the TIU and the Lionel command base together. Depending upon which Lionel Command Base is being connected, the appropriate cable is required. To be useable, a Cab- 1, Cab-1L or Cab-2 remote control requires the inclusion of its companion command base.

At the present time, there are three MTH cables that may be used to connect to a Lionel command base. The three cables are:

- #50-1018 TIU/TMCC 6' Connector Cable may be used only to connect the TIU to a Lionel TMCC Command Base.
- #50-1007 TIU/TMCC 6' Connector Cable may be used only to connect the TIU to a Lionel Legacy Command Base or a Lionel Cab-1L Command Base.
- #50-1032 TIU/TMCC-Legacy 6' Connector Cable may be used to connect the TIU to a Lionel TMCC Command Base, a Lionel Cab-1L Command Base or a Lionel Legacy Command Base.

For the following discussion, if there is a Lionel LCS module plugged into the Legacy Command Base's serial port, MTH cable #50-1007 or #50-1032 may not be plugged into the serial port. Instead, a Lionel SER2 module is required and the cable must be plugged into its serial port. Refer to the following section, 2. Controlling Legacy Engines from the DCS Application, for instructions and connection diagrams.

Wiring for TMCC Engine Control (Only)

The following wiring methods allow control of TMCC engines, and Legacy engines that are configured as TMCC engines. If complete control of Legacy engines is desired, use the connection diagrams described in the following section 2. Controlling Legacy Engines from the DCS Application.

Regardless of the method of TMCC control chosen, a Lionel command base is wired by connecting its "one wire" to each loop of tracks upon which it is desired to operate TMCC or Legacy engines, as instructed in the command base's documentation.

Alternately, the command base's "one wire" can be attached to the Common connection of all of the TIU's channel's terminal blocks. If this method is used, it's important to note that only the original, Rev. G, TIU has the Common terminals of all channels connected internally and later revisions of the TIU do not. If a TIU other than a Rev. G is used, a Common connection of all of the TIU's channel's terminal blocks should be connected together, and to the command base, to ensure that the TMCC signal is present on all channels.

Another alternative is to connect the command base's "one wire" to any one TIU's channel's terminal block, as long as all of the transformers that are providing power to TIU channels are in phase and have one of their Common terminals connected to a Common terminal of all other track power transformers.

It is not recommended that the "one wire" be connected directly to Common (black) terminal of a TIU input channel. This would pass the TMCC or Legacy signal directly through the TIU channel's DCS signal generator, and no good can possibly come from that.

If control of TMCC engines from the DCS Application is desired, the MTH cable is connected between the serial port on the TIU and the serial port on a Lionel command base. If both TMCC and Legacy Command Bases are to be connected to the layout, the TIU is connected to the Legacy Command Base.

Regardless, if the TMCC and Legacy Command Bases are both to be connected to a TIU, only the "one wire" from the Legacy Command Base should be connected as described above, and only one command base is ever connected to one DCS TIU.

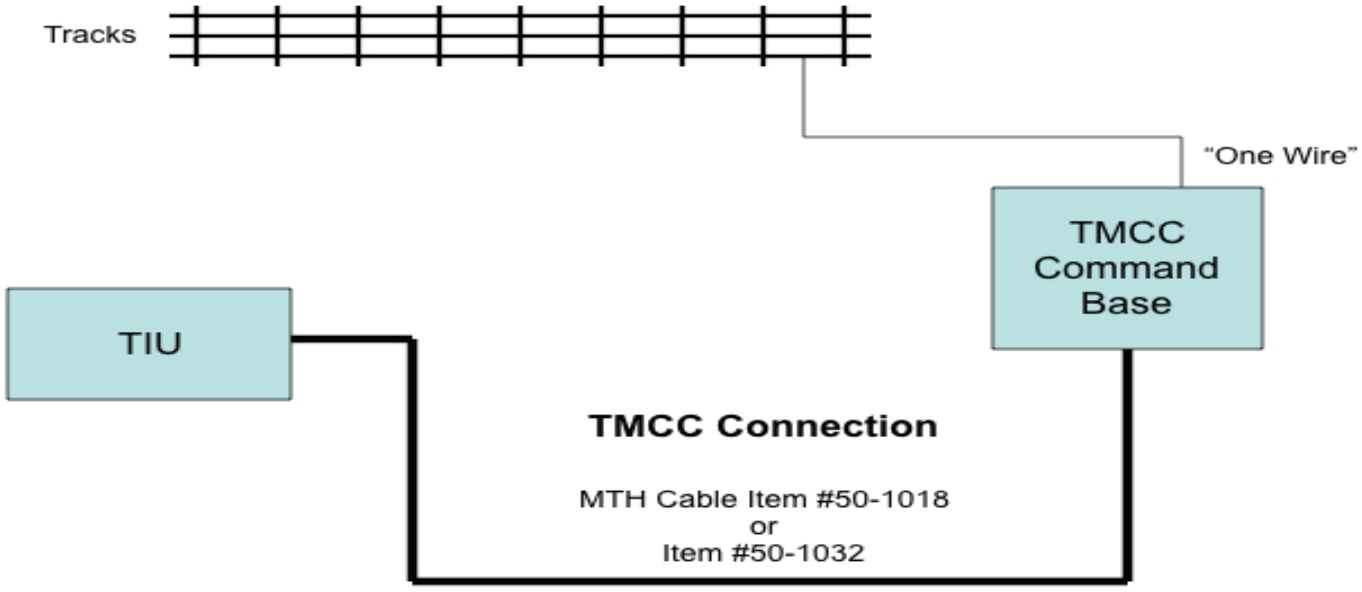

Figure A1 - Wiring for TMCC/Legacy Operation Using a TMCC Command Base

Connecting DCS to a TMCC Command Base

If the DCS TIU is connected to only the TMCC Command Base, the MTH cable used is either MTH item #50-1018, TIU/TMCC 6' Connector Cable or #50-1032 TIU/TMCC-Legacy 6' Connector Cable. The above diagram illustrates how the DCS TIU is connected only to a TMCC Command Base.

When connected this way, with the Legacy Base "one wire" connected to an outside rail, the following operation is possible:

- The DCS Application will operate all DCS, TMCC and conventional engines in their respective modes, and will operate Legacy engines in TMCC mode. The Legacy engines must be configured in the DCS Application as TMCC engines.
- The Cab-1 will operate TMCC engines and Legacy engines in TMCC mode.

Connecting DCS to a Legacy Command Base

If the DCS TIU is connected to only the Legacy Command Base or the Base-1L Command Base, the MTH cable used is either MTH item #50-1007, TIU/TMCC 6' Connector Cable or #50-1032 TIU/TMCC-Legacy 6' Connector Cable. The following diagram illustrates how the DCS TIU is connected only to a Legacy Command Base.

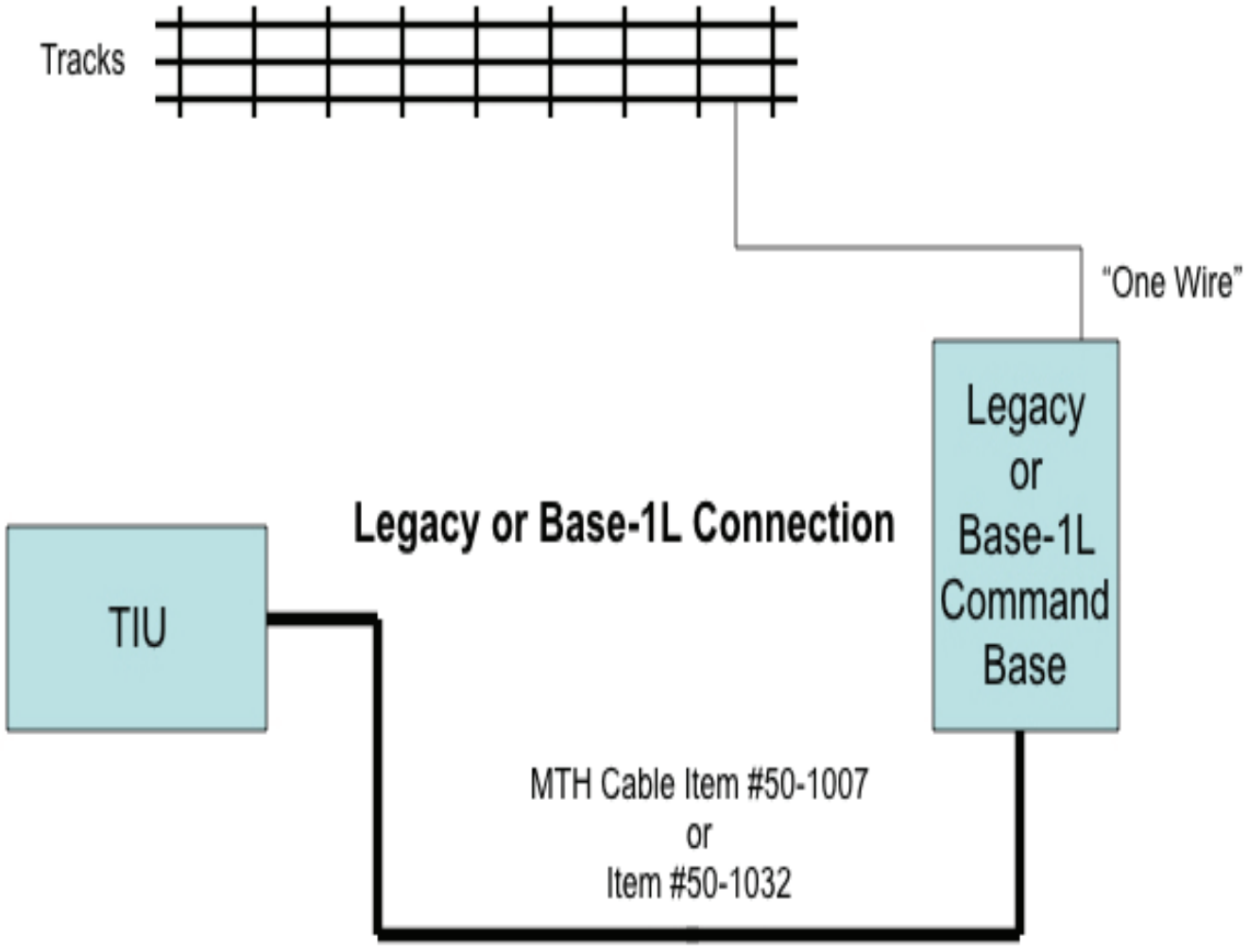

Figure A2 - Wiring for TMCC or Legacy Operation Using a Legacy or Base-1L Command Base

When connected this way, with the Legacy Base "one wire" connected to an outside rail, the following operation is possible:

- The DCS Application will operate all DCS, TMCC and conventional engines in their respective modes, and will operate Legacy engines in TMCC mode. The Legacy engines must be configured in the DCS Application as TMCC engines.
- The Cab-1 will operate TMCC engines and Legacy engines in TMCC mode.
- The Cab-1L will operate TMCC engines and Legacy engines in Legacy mode.

Connecting DCS to both TMCC and Legacy Command Bases

If the DCS TIU is connected to both the Legacy Command Base and also the TMCC Command Base, the MTH cable used is MTH item #50-1007 TIU/TMCC 6' Connector Cable or, preferably, MTH item #50-1032 TIU/TMCC-Legacy 6' Connector Cable, and the Legacy-supplied "Y" cable is also required. The following diagram illustrates how the DCS TIU is connected to a Legacy Command Base, and also a TMCC Command Base.

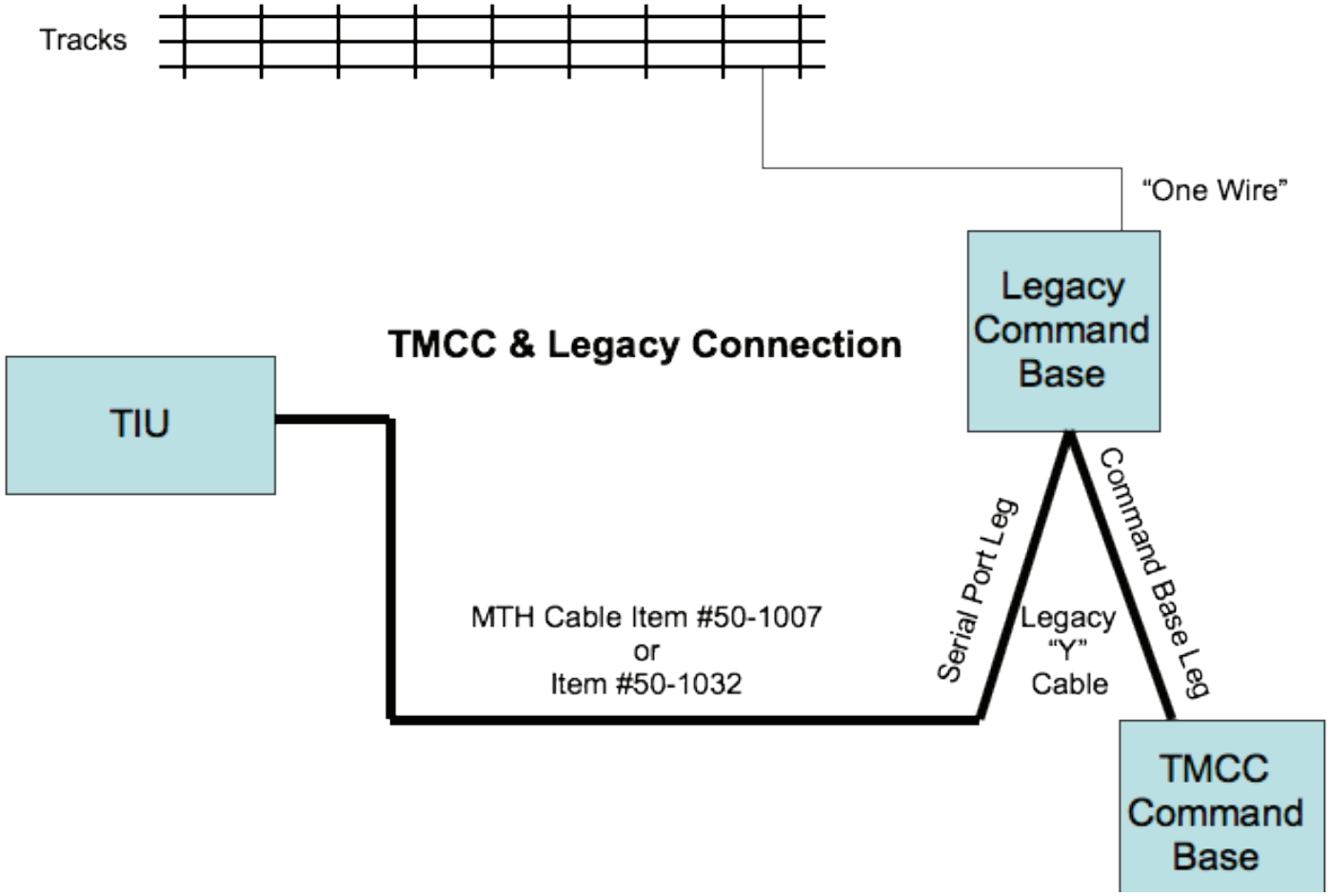

Figure A3 - Wiring for TMCC and Legacy Operation Using a Legacy Command Base

When connected this way, with the Legacy Base "one wire" connected to an outside rail, the following operation is possible:

- The DCS Application will operate all DCS, TMCC and conventional engines in their respective modes, and will operate Legacy engines in TMCC mode. The Legacy engines must be configured in the DCS Application as TMCC engines.
- The Cab-1 or Cab-1L will operate TMCC engines and Legacy engines in TMCC mode.
- The Cab-2 will operate TMCC engines in TMCC mode and Legacy engines in Legacy mode.

2. Controlling Legacy Engines from the DCS Application

The Premium version of the DCS Application allows control of Lionel Legacy engines in Legacy mode with the use of all Legacy features. To do so, however, requires more than just connecting a TIU's serial port to the serial port of a Lionel Legacy Command Base.

While this simple connection allows operating TMCC engines in full TMCC modes, it will not allow full control of Legacy engines because the Legacy Command Base does not accept Legacy commands via the command base's serial port.

If the normal TIU to command base serial connection is utilized, only the following control of TMCC or Legacy engines is possible using the DCS Application:

- TMCC engines may be operated in full TMCC mode.
- Legacy engines defined as TMCC engines in the DCS Application may be operated as TMCC engines with full TMCC control.
- Legacy engines defined as Legacy engines may be added to the DCS Application and started up and shut down, and their basic, TMCC-like features and functions may be used. However, they will not accept commands to move forward or reverse, and some Legacy-only features, such as the quilling whistle, may not work.

This is because Legacy-specific commands are not accepted through the Legacy Command Base's serial port. This includes Legacy speed commands, which are different from TMCC speed commands. Fortunately, there is a solution to this problem.

There are two ways to implement full control of Legacy engines from the Premium version of the DCS Application. Which solution is appropriate depends upon whether or not Lionel's WiFi solution, LCS, has already been implemented on the layout.

The devices and cables involved in the solution may include any of the following:

- Always required is *either* an MTH #50-1007 TIU/TMCC 6' Connector Cable *or* an MTH #50-1032 TIU/TMCC-Legacy 6' Connector Cable, but not both, to connect the TIU to a Lionel Legacy Command Base. *The MTH #50-1032 is preferred.*
- If already present, a Lionel product 6-81325 LCS WiFi Module will be utilized.
- The Lionel product 6-81326 SER2 Module is always required.
- If not already present, a Lionel 6-81499 LCS DB-9 Cable With Power Supply will be required.
- If a Lionel 6-81325 LCS WiFi Module is already present, then a Lionel LCS PDI Cable will be required.

The components and cables described above are shown in the figures below.

Figure A4 - MTH #50-1032 TIU/TMCC-Legacy 6' Connector Cable

Figure A5 - Lionel 6-81325 LCS WiFi Module

Figure A6 - Lionel 6-81326 SER2 WiFi Module

Figure A7 - Lionel 6-81499 LCS DB-9 Cable With Power Supply

Figure A8 - Lionel PDI Cable

Implementing DCS Application Legacy Control if LCS is Installed

If LCS is already installed on the layout, the solution is to connect a Lionel product number 6-81326 SER2 Module to the existing Lionel product number 6-81325 LCS WiFi Module, using a Lionel LCS PDI cable. These PDI cables come in 1', 3' 10', and 20' lengths (product numbers 6-81500, 6-81501, 6-81502, and 6-81503, respectively), and the PDI cable only needs to be long enough to connect the LCS and SER2 modules.

The MTH #50-1032 cable then is connected between the TIU's serial port and the SER2's serial port.

The figure below describes exactly how the connections are made.

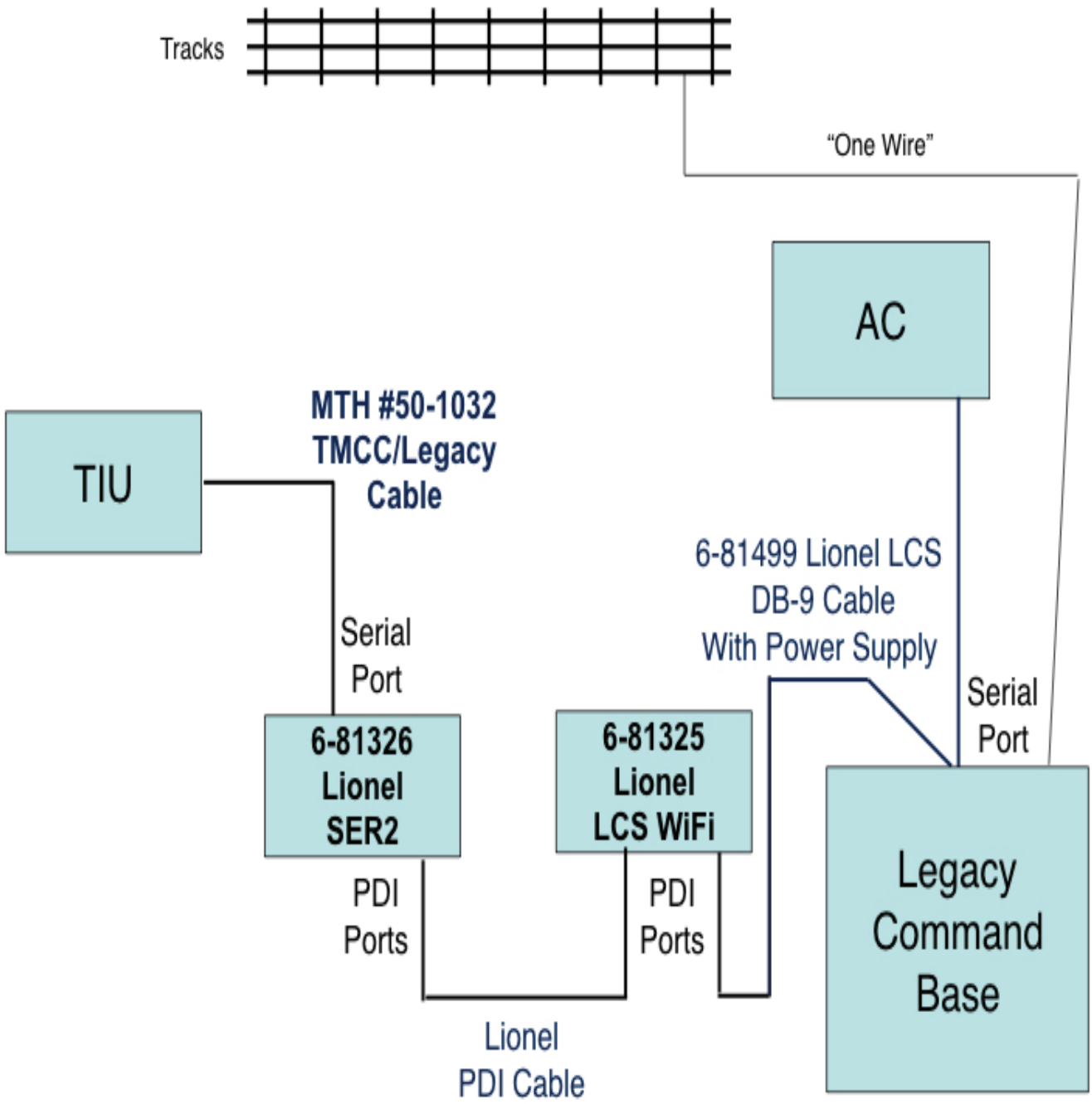

Figure A9 - Implementing DCS Application Legacy Control if LCS is Installed

Implementing DCS Application Legacy Control if LCS is Not Installed

If an LCS Module is not already installed on the layout and it isn't desired to install one, the solution is to connect a Lionel product 6-81326 SER2 Module directly to the Legacy Command Base using a Lionel 6-81499 LCS DB-9 Cable With Power Supply.

The MTH #50-1032 cable then is connected between the TIU's serial port and the SER2's serial port.

The figure below describes exactly how the connections are made.

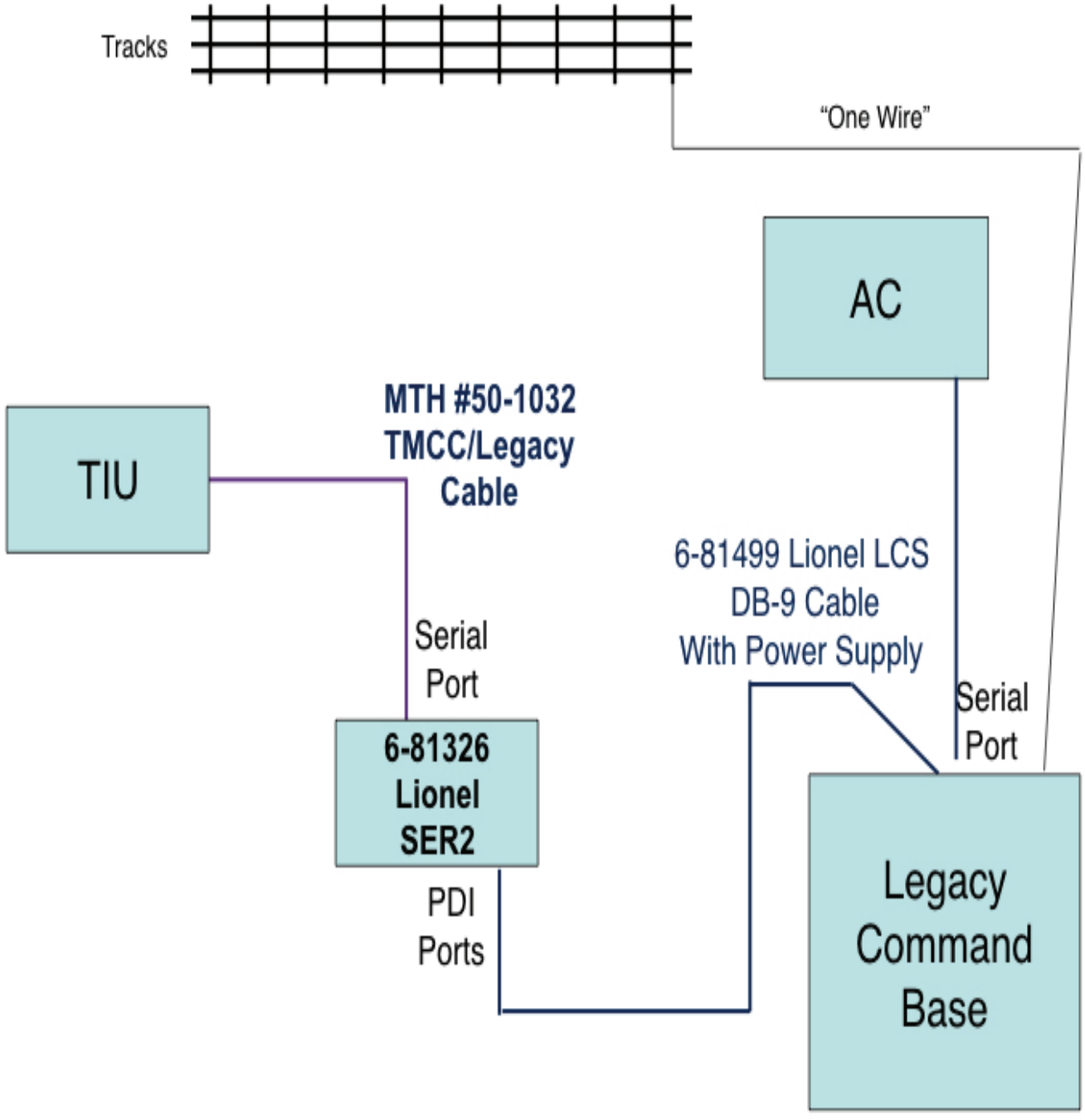

Figure A10 - Implementing DCS Application Legacy Control if LCS is Not Installed

3. Considerations for Control of TMCC and Legacy Engines Using the DCS Application

TMCC and Legacy engines are controlled in the same manner as DCS engines using the DCS Application. They are selected from the Active Engine List and operated from the Engine Control Screen. However, there are a few caveats of which the DCS operator should be aware.

Refreshing the Engine Roster

Whenever the Refresh button is tapped, or the Engine Roster Screen is pulled down, the DCS Application refreshes the Engine Roster by sorting all DCS, TMCC and Legacy engines according to the following rules:

- If a DCS engine is on a powered track, it will go into the Active Engine List.
- If a DCS engine is not on a powered track, it will go into the Inactive Engine List.
- All TMCC and Legacy engines, regardless of whether or not they are on powered tracks, will go into the Inactive Engine List.

This leads DCS Application operators to believe that, in order to operate a Legacy or TMCC engine that is in the Inactive Engine List, it's necessary to delete and re-add the engine. However, this is not the case at all. Rather, to operate a TMCC or Legacy engine that is in the Inactive Engine List, proceed as follows:

- Ensure that the TMCC or Legacy engine is on a powered track.
- Tap Edit at the top of the Engine Roster Screen.
- For iOS devices, move the parallel bars icon to the right of the engine's name, to move the engine up into the Active Engine List.
- For Android devices, tap the up-arrow icon to the right of the engine's name, to move the engine up into the Active Engine List.
- Tap Done at the top of the Engine Roster Screen.
- Return to the Engine Control Screen, where the TMCC or Legacy engine is now the Active Engine.

Importing Legacy Engines From a DCS Remote's Back File

When a DCS Remote's backup file is imported into the DCS Application, any Legacy engines that were present in the backup file are added to the Inactive Engine List, as are TMCC engines. However, since the DCS Remote is not capable of recognizing Legacy engines as being any different from TMCC engines, the Legacy engines are added to the DCS Application's Inactive Engine List as TMCC engines.

If these Legacy engines are to be operated as TMCC engines, nothing further is required. However, if the DCS operator desires to use the DCS Application to operate the Legacy engines in full Legacy mode, they must be deleted from the DCS Application and re-added as Legacy engines.

Refer to The DCS WiFi Companion 1st Edition, Part VII - Engine Operation Using the DCS Application, 1. DCS Application Engine Operation Screens, DCS Application Edit Engine Roster Screen and DCS Application Add Engine Screen, respectively, to delete and add the engines.

Changing a TMCC or Legacy Engine's DCS ID#

Although the Engine Settings Screen for TMCC or Legacy engines doesn't allow the DCS operator to change the DCS ID# of TMCC or Legacy engines, it is still possible to get a TMCC or Legacy engine into whatever DCS ID# in the DCS Application's engine roster that is desired, through a little planning before attempting to add the engine.

To get the TMCC or Legacy engine into a particular DCS ID#, proceed as follows:

- First, use the Engine Settings Screen for TMCC or Legacy engines (refer to The DCS WiFi Companion 1st Edition, Part VII - Engine Operation Using the DCS Application, 1. DCS Application Engine Operation Screens, DCS Application Add Engine Screen) to put "imaginary", nonexistent TMCC or Legacy engine entries into the DCS Application to act as placeholders and use up the space between the first open DCS ID#, which is where DCS wants to put the next TMCC or Legacy engine to be added, and the DCS ID# where the engine is actually desired to be placed.
- Enter the name of the imaginary engine as a fictitious engine name, such as "Imaginary # 1", "Imaginary # 2", etc.
- Enter the engine's TMCC address as "1".After adding enough imaginary engine entries to get to the desired DCS ID#, add the "real" TMCC or Legacy engine so that it gets into the next available DCS ID#.
- After you've added your "real" TMCC or Legacy engine, delete all of the imaginary engines (refer to The DCS WiFi Companion 1st Edition, Part VII - Engine Operation Using the DCS Application, 1. DCS Application Engine Operation Screens, DCS Application Edit Engine Roster Screen) to regain the DCS ID#'s that were temporarily used by the imaginary engine entries.