

Protosound 3/2 “Stacker” Boards

What is a STACKER BOARD? A Stacker board is a combination of a bottom Protosound 3 board (responsible for storing all the operating data about the locomotive and the sound file, specific to the locomotive you install it into) along with a top board that provides all the sockets for controlling lights, couplers, smoke, etc. There are 2 versions of the stacker boards; 5 Volt (designed to replace factory installed Protosound 2.0 5 Volt circuit boards) which have “Hirose” style connectors. The second version is a 3 Volt (designed to replace factory installed Protosound 2.0 3 Volt circuit boards) which have “Chyao Shiunn” style connectors.

By using a Protosound 3 bottom board you gain the benefits of being able to remove the rechargeable battery and gain a larger memory (so a more current Protosound 3.0 sound file can be loaded if desired) and becomes compatible with DCC (Digital Command Control).

All MTH locomotives with factory installed Protosound 2.0 (either 5 Volt or 3 Volt) use incandescent lighting. The top board operates these by providing the exact same connectors designed to operate the incandescent lamps at the appropriate voltages in those models along with smoke, couplers, etc..

The Protosound 3/2 Stacker Board is physically smaller than a Protosound 2- 5 Volt board set, but slightly larger than the Protosound 2 – 3 Volt board set. (This means you may encounter a problem fitting the Stacker board into the boiler of some Ready-to-Run starter set boilers). The bridge rectifier is mounted to the bottom circuit board, so it is in a different physical location than the original Protosound 2 boards. Because the rectifier is mounted in a different position you will likely want to use our Stacker board heat sink kit (IC0000026), which will prevent you from having to make some serious modifications to the factory installed heat sink. The rechargeable battery & charging port can be removed entirely (as the Protosound 3 bottom board uses super caps for backup power). If your model is a Protosound 2.0 5 Volt version you will need to replace the speaker with a 4 Ohm speaker of appropriate size.

Please note that in most instances the Stacker Board will be a plug and play replacement for the factory installed Protosound 2.0 board. However, there will be some unique situations where you may have to extend a couple wires because the position of a socket is not in the “exact” same position as the Protosound 2.0 board. Instances such as this include the Premier 2500HP transfer diesel. In some situations where you are dealing with a locomotive with a “small” cavity for electronics such as a Premier Climax, it may be necessary to modify a mounting post or two. Keep in mind these examples are the exception, not the rule.

How it all works

The best analogy we have come up with is think of the stacker board as a “body”. The body needs a brain which we call a “Chain code file”. Finally consider the “sound file” as the personality.

Chain Code File; This is the software that is loaded on the stacker board that tells every output how to operate; front lights, marker lights, ditch lights, MARS light, strobe lights, rear lights, etc. It sets the correct voltages for smoke unit outputs (and makes accommodations for things such as station stop announcements in subways or trolleys). If the correct chain code file is not loaded into the stacker board then “you can expect undesired results” (i.e. front headlight on in reverse, no oscillating ditch lights, smoke only in neutral, etc.). There are 12 different, unique chain code files for Protosound 3/2 stacker boards. It’s really quite simple; use the documents “PROTOSOUND 2 3-VOLT RECOMMENDED CHAIN CODE FILE or PROTOSOUND 2 5-VOLT RECOMMENDED CHAIN CODE FILE documents found under “helpful stuff” at mthpartsandsales.com. Once you know what chain code file you need, visit <https://mthtrains.com/chainfiles>. This will return the download page for all 12 different chain code files.

****NOTE:** Chain code files designed for Protosound 3.0 diesel boards & Protosound 3.0 steam boards will not yield desired results if loaded into a Stacker Board! ONLY USE THE PROVIDED STACKER BOARD CHAIN CODE FILES accessible on mthtrains.com website!

Sound File: This is the all the sounds you load into your locomotive; prime mover, horn, bell, freight yard sounds, passenger sounds, road name specific announcements, etc. The sound file is the software that drives those sounds the locomotive makes when operating.

How do I program a Stacker Board?

Programming an MTH engine with a stacker board (or any other Protosound 2.0 or Protosound 3.0 board) can be accomplished with the following:

- a.) A Computer or a laptop connected to the internet
- b.) MTH Consumer Loader (we recommend version 5.0.0, as it’s the most current)
- c.) A USB cable or USB to RS232 adapter cable
- d.) An MTH TIU (Rev L or lower)
- e.) Separate 3-foot-long section of track
- f.) Any 3-Rail AC transformer (smooth sine wave preferred)
- g.) Any model railroad DC power supply (you can substitute that for an AC transformer)

We have included the instruction manual for the DCS Consumer Loader version 5.0 in this document, for easy reference. It can also be downloaded from the web at;

https://mthtrains.com/sites/default/files/download/instruction/DCSConsumerLoader_V5.0.0_Instructions.pdf

The Consumer Loader v 5.0.0 instructions outlines how to download Chain code files **and** sound files and install them in your locomotives

We recommend a Separate Programming Track

What's a programming track? This is a 3-foot-long section of track completely isolated from your railroad that you use for programming locomotives. Why a separate section of track? To prevent the possibility of the programming data becoming corrupted or failing. When you have a separate section of track designed for programming only the software will only load into the item on that track (and not another locomotive you forgot was on the track, an accessory connected to the mainline, etc.) At the end of the day, it just makes for peace of mind and reduces the chances of programming corruption. ****Note:** Be sure to tie BOTH outside rails together for Ground on 3-rail track! It is also recommended that the length of the wires between the TIU and the Programming Track be 25 foot long for maximum reliability.

Factory Installed Chain Code & Sound File

Each Protosound 3/2 Stacker Board comes from MTH Parts & Sales with what is called "SD70 Test Code". This chain code file should not be used in a completed installation; it is for installation testing only. This test code enables all the lighting outputs on the Stacker Board. Once a Stacker Board is installed (or tested on a PS2 test fixture) all the even numbered lighting outputs will illuminate in one direction. Then all the odd numbered lighting outputs will illuminate in the opposite direction. The smoke unit can be turned on and off, but it will function as a diesel smoke unit (this means it will not puff when first installed in a steam locomotive) until a new chain code file is programmed. Once again, the chain code file and sound file we load on Stacker Boards is to test all outputs and verify the sounds are fully functional, it is not designed for any final installation application.

Selecting Sound Files for your Stacker Board

As described above, the "Sound File" is the "personality" for your Stacker Board. There are several hundred different sound files to choose from on the mthtrains.com website. You should know that we strongly recommend you use a sound file from a Protosound 2.0 3Volt model or a Protosounds 3 model. Some Protosound 2 5-Volt models have UPDATED sound files, which means they WILL work on a stacker board, however, some models do not. Take a look at the example below.

You have just installed a Stacker Board in a Premier SD70M. The model had a factory installed Protosound 2 5Volt soundboard (say its 20-2288-1 Union Pacific SD70M). You installed the Stacker Board and now you need to select the appropriate sound file. Visit mthtrains.com and enter the product number into the search box. When the Union Pacific SD70M model returns, click into the model's specific information. Then click on

the “Support” tab. There you will see one or two sound file icons. IF there is a second sound file icon it will have the word “UPGRADE” underneath Protosound 2. You can save and use this sound file in your Stacker Board. However, if there is not a second sound file with the word UPGRADE, you will need to find a sound file that was made for a Protosound 2 3-Volt or Protosound 3.0 locomotive. To do this follow the instructions below.

Use either the “PROTOSOUND 2 3 VOLT RECCOMMENDED CHAIN CODE FILE” document or the “LOCOMOTIVES DELIVERED WITH PROTOSOUND 2.0 3VOLT – PREMIER DIESEL / ELECTRIC” document (both accessible under “Helpful Stuff” on mthpartsandsales.com). Use the “CTRL F” function to find the product number of other “SD70M” locomotives. 20-2610-1 Is a Canadian National SD70M, which has a Protosound 2 3V sound file. You can use this sound file for your installation. OR you can search an SD70M that was delivered with Protosound 3, by using the “LOCOMOTIVS DELIVERED WITH PROTOSOUND 3 – PREMIER DIESEL / ELECTRIC” list.

In which case the closest model you would find would be an SD70MAC. You could use this sound file (and you may get a quillable horn and some extra sounds).

Once you have the product number of the locomotive, in which you plan to use the sound file enter it into the “keyword search” at mthtrains.com. Search that number, click on the product, click on the “SUPPORT” tab. There you will find the sound file (with the Protosound 2 logo). Hover your cursor over the sound file icon. Right click on your mouse and select “Save Link As”. The instructions for downloading & installing sound files can be found in the Consumer Loader v 5.0.0 Instruction Manual below.

NOTE: MTH Parts & Sales does not make any guarantees or warranties for loading a “pirated” sound file downloaded from somewhere other than mthtrains.com. We ONLY recommend MTH created sound files be downloaded into Stacker Boards.

For questions or clarification please feel free to email MTH Parts & Sales at info@mthpartsandsales.com

Programming Locomotives & DCS Components Using DCS & DCS Software

Locomotives equipped with Proto-Sound 2.0 and 3.0 and the components of the M.T.H. DCS Digital Command System can be reprogrammed with new sounds or software features available via download from the M.T.H. and Proto-Sound 2.0 websites. The following instructions detail how such downloads function and what tools are required to complete the process.

If desired, most M.T.H. Authorized Service Centers can perform the reprogramming for consumers. A service charge may be applicable. See your local service center for more details.

Below is a table outlining the items needed for specific functions that can be performed with the M.T.H. Consumer Loader. You will need the following items (All functions require a PC or laptop running at least Windows XP):

Function	Required Items
Load Engine Sound File	TIU, Engine, Transformer, USS Cable (Rev L TIU only) or USS-Serial adapter or DS-9 serial cable **DC transformer can be used in place of an AC transformer.
Load Chain Code Files	TIU, PS 3/2 Stacker equipped O gauge locomotive, PS3.0-equipped O Gauge locomotive, USS Cable (Rev L TIU only) or USS- Serial adapter or DS-9 serial cable
Load TIU Firmware	TIU, Transformer, USS Cable (Rev L TIU only) or USS-Serial adapter or DS-9 serial cable, 1/8" STEREO mini-to-mini audio cable. If using a Rev L TIU and a USS Cable you don't need the transformer
Remote Firmware	TIU, Remote, USS Cable (Rev L TIU only) or USS-Serial adapter or DS-9 serial cable, 4-wire phone handset cord (goes between the TIU and the Remote)
	DCS Commander, USS to serial adapter or DS-9 serial cable, AC or DC Transformer

GETTING STARTED

To download new sound files onto any Proto-Sound 2.0 or later equipped locomotive, or to load a new software revision into your DCS system or DCS Commander, you will need the following items:

1. DCS Consumer Loader Software (Version 5.00 - available from www.protosound2.com)
2. A Transformer or power supply to power the DCS Track Interface Unit (TIU). ****A DC transformer can be used in place of an AC transformer.**
3. A personal computer with an available Serial or USB port.
4. A standard 4-pair telephone handset cord.
5. A standard Db9 male-to-female serial PC cable or a USB Cable .
6. A 1/8" Stereo Mini-to-Mini Cable (M.T.H. Part# 50-1009).
7. A USB to Serial Adapter Cable if your computer doesn't have a Serial Output jack.

DOWNLOADING THE CONSUMER LOADER SOFTWARE

1. **First, download the DCS Consumer Loader Software from www.protosound2.com**

To download the Consumer Loader:

- A. Download "V5.00.exe" by choosing the "Download NOW!" link.
- B. Complete the required fields and follow the onscreen prompts.
- C. When prompted click on the file name and choose the location in your computer to save the file. The file should be saved where it can be easily found, like the Desktop.

2. **Next, download the latest version of DCS Software.**

To download Version 6.1 or later:

- A. Download "Version 6.1" by choosing "Download NOW!".

MTH DCS Consumer Loader version 5.00

What's new:

Allows the TIU to interface with the DCS App and Wi-Fi Interface Unit (WIU) (Only if using TIU Code version 6.1)

Operates With Rev. G through Rev. L TIU's.

Loads Chain Code Files (DSP Firmware, FPGA, CV Data). This is the zip file that allows existing MTH HO PS3 engines to be updated to run expanded DCC

The Loader now remembers the last folder you explored to. This is especially handy if you keep all your MTH files in the same folder (for example, the MY MTH Files folder that gets created when you install the Loader program

Improves the sound file and code chain file loading by automatically adjusting the data rate for files that contain more than 50% zeros. The progress sub-bar will turn yellow to indicate a temporary data rate adjustment. Previously the Loader would try at the highest data rate, determine that an error occurred in the data transfer, then try the whole sector over again. In essence, the Loader is now much, much faster

Installation Instructions:

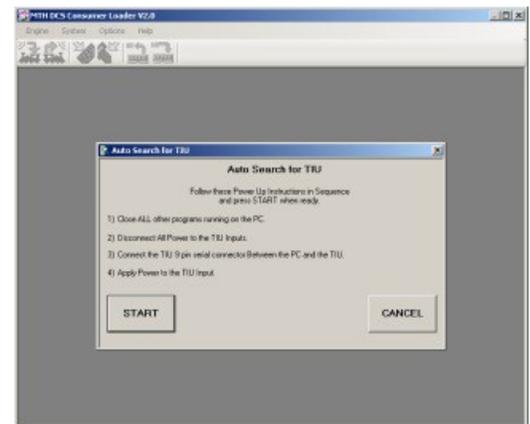
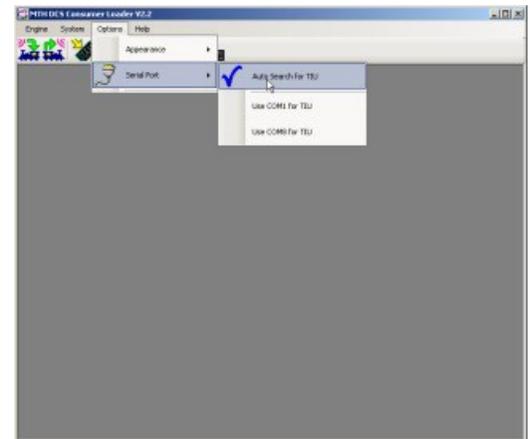
The MTH Consumer Loader program can operate under a 32-bit or 64-bit Windows environment.

1. Download and Save the self-extracting executable to a location on your PC where you can easily find it
2. Run the exe and note that the default folder that your unzip program will want to send those files to will be a TEMP folder. If you do not want the files to go to your TEMP folder then select "Browse..." and select an appropriate place to unzip the files. A folder on your Desktop or in you're My MTH Files folder perhaps

USING THE DCS CONSUMER LOADER TO REPROGRAM DCS, LOCOMOTIVES & THE DCS COMMANDER

Setting up your Com port

1. Double-click the MTH Loader icon
2. Connect your TIU to your PC via a DB-9 serial cable or USB to serial adapter
3. Apply power to your TIU
4. Click on **Options**
5. Select **Serial Port**
6. Select **Auto Search for TIU**
 - a. The Loader program will now go out and look for a TIU on the available Com ports on your PC. Once it finds the TIU it will lock on to the serial port and use it until you tell it to change to another Com port. The Loader



program will remember the Com port even after you shut the program down

7. You have now successfully set up the Com port for your Loader.

Loading TIU Code

1. Click on the TIU icon or select **System ->Send Code to the TIU.**

HINT If you're not sure of an icon's function, just roll your cursor over one of them and a dialog box will appear telling you what the icon does.

2. Follow the on-screen instructions in the Loader program.

3. Should you experience a failure the Loader program will allow you to Retry or Cancel. Pressing Retry will force the Loader to attempt to reconnect and reload.

4. If, after several retries, you cannot successfully load TIU code then try the following:

- a. Reset power to the TIU and close and re-start the Loader program.
- b. Repeat steps 1 and 2 above.
- c. Contact MTH Service for further assistance.

Loading Remote Code

1. Click on the Remote icon or select **System->Send Code to the Remote.**

2. Follow the on-screen instructions in the Loader program.

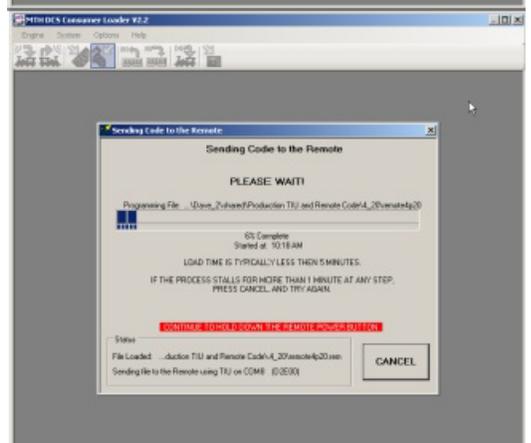
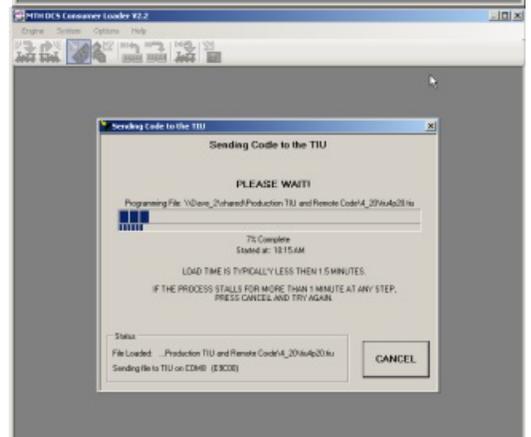
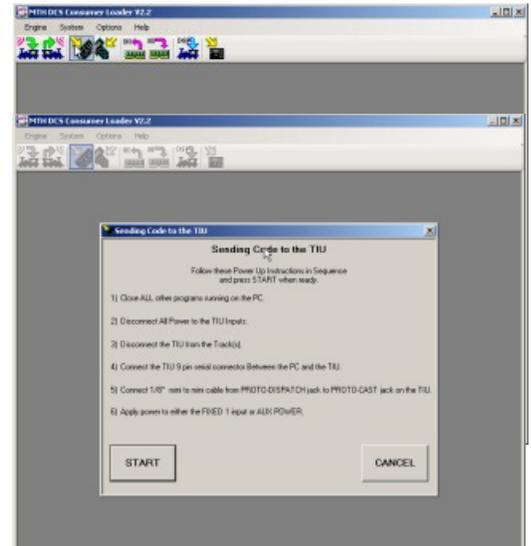
3. Should you experience a failure the Loader program will allow you to Retry or Cancel. Pressing Retry will force the Loader to attempt to reconnect and reload.

4. If, after several retries, you cannot successfully load Remote code then try the following:

- a. Reset power to the TIU and close and re-start the Loader program.
- b. Release the power button on the Remote.
- c. Unplug and re-plug the DCS Remote tether at both the Remote and TIU.
- d. Repeat steps 1 and 2.
- e. Try a different Remote tether cable.

Remember This MUST be a 4-wire cable!

f. Contact info@mthpartsandsales.com for further assistance.



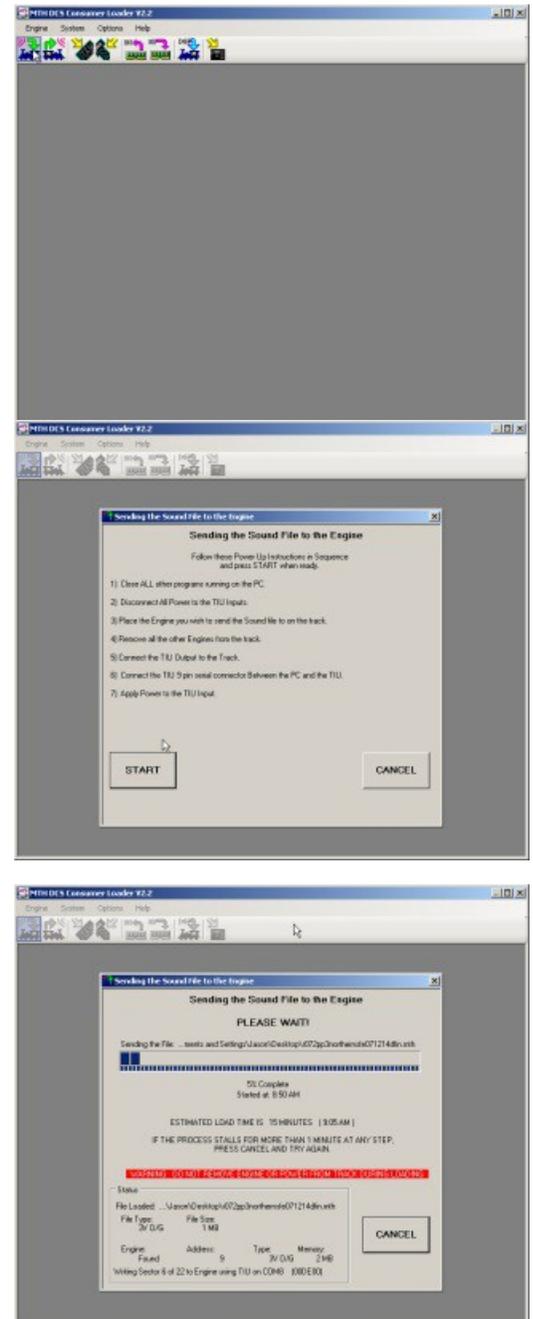
Sending Sound Files to an Engine

Note If you are attempting to load a PS 3/2 Stacker or PS3.0-equipped Steam or Diesel engine you must have version 6.1 or higher DCS code loaded into your TIU.

1. Click on the Send Sound File to Engine icon or select **Engine-> Send Sound File to the Engine**
2. Follow the on-screen instructions in the Loader program
3. If, during the Sound File transfer, the Loader sees an error it will attempt to retry the sector of memory it was previously loading. Should it fail again the Loader will prompt you to hit Retry or Cancel. Hitting Retry will force the Loader to re-attempt loading from that failed sector of memory
4. If you get continuous errors during the Sound File loading, remove power to the TIU/Engine, Hit Cancel on the Loader and then restore power to the engine and restart the Loader program

HINT If you keep getting errors after performing Step 4, it is recommended to have the engine clip leaded to the TIU output, if possible. Otherwise, connect a short section of track directly to the output of the TIU. You want to minimize the chance for DCS signal interference from other items that may be on your layout (track powered switches/accessories, track powered rolling stock, etc.). ****Separate Programming Track**

For those users with Rev L TIU's you may actually find that an extra 10 feet of wire between the output of the TIU and the track will help with communications.



Loading Chain Code Files

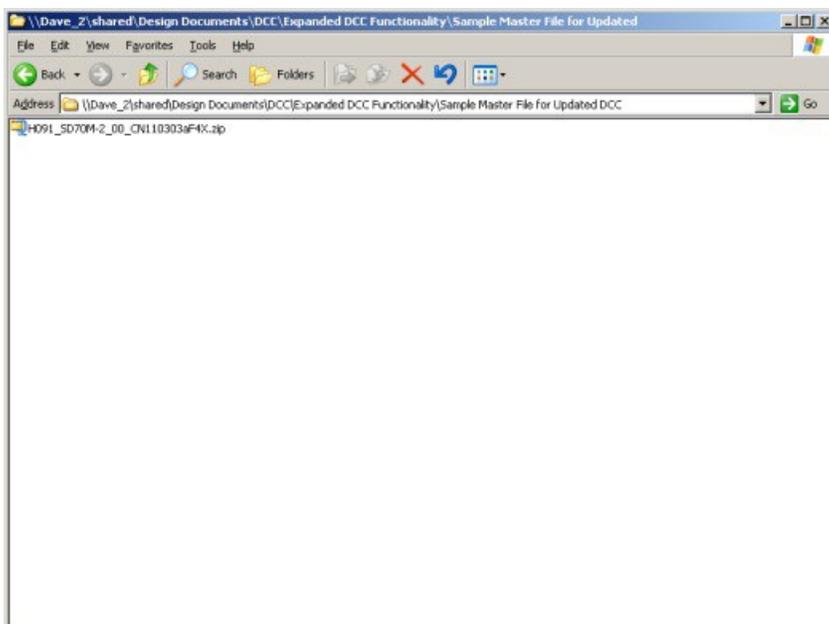
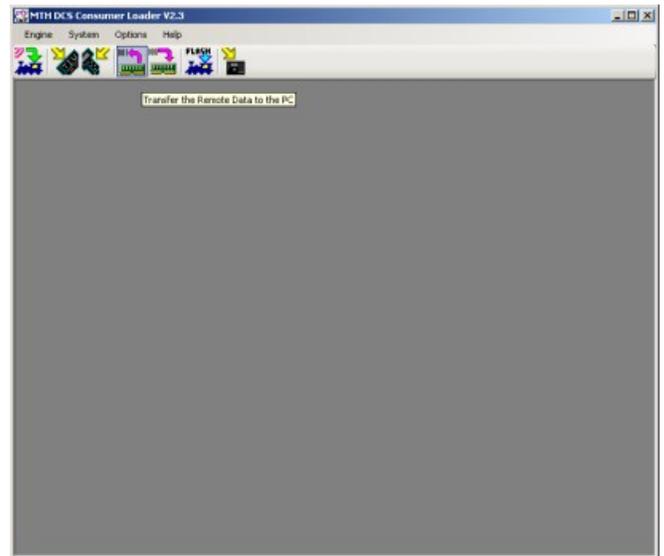
MTH's Loader version 6.1 now allows you to load chain code files into a Proto-Sound 3.0 or Protosound 3/2 Stacker engine right over the rails using a TIU running version 6.1 or later.



What Are Chain Code Files?

These are a series of files that are put into a zip format. Inside this zip file are multiple files and one text file that tell the Loader what filenames to load. The Chain Code Files are bundled along with the sound file (.mth) on the website.

Most PS3.0 engines on the website will have both the .mth and the .zip files associated with them. That is, for a Protosound 3 locomotive, when you search for a particular item number and click on the link for the sound file you are getting the sound file and the code file all in one zip file. For Protosound 3/2 Stacker Boards you MUST use the Stacker Chain Code File designated for that particular locomotive. (The recommended Chain Code File can be located on the "CHAIN CODE FILES_PS2_5V and CHAIN CODE FILES_PS2_3V lists available under "helpful Stuff on mthpartsandsales.com.)



What Is Needed To Load Chain Code Files?

In order to load Chain Code Files you need the following items:

TIU running version 6.1 or later

PC with Loader 5.00

Serial cable or a USB to serial adapter or a USB cable (USB cable can be used with Rev L TIU only)

Proto-Sound 3.0-equipped locomotive or a Protosound 3/2 Stacker equipped locomotive.

An unzip utility like Winzip

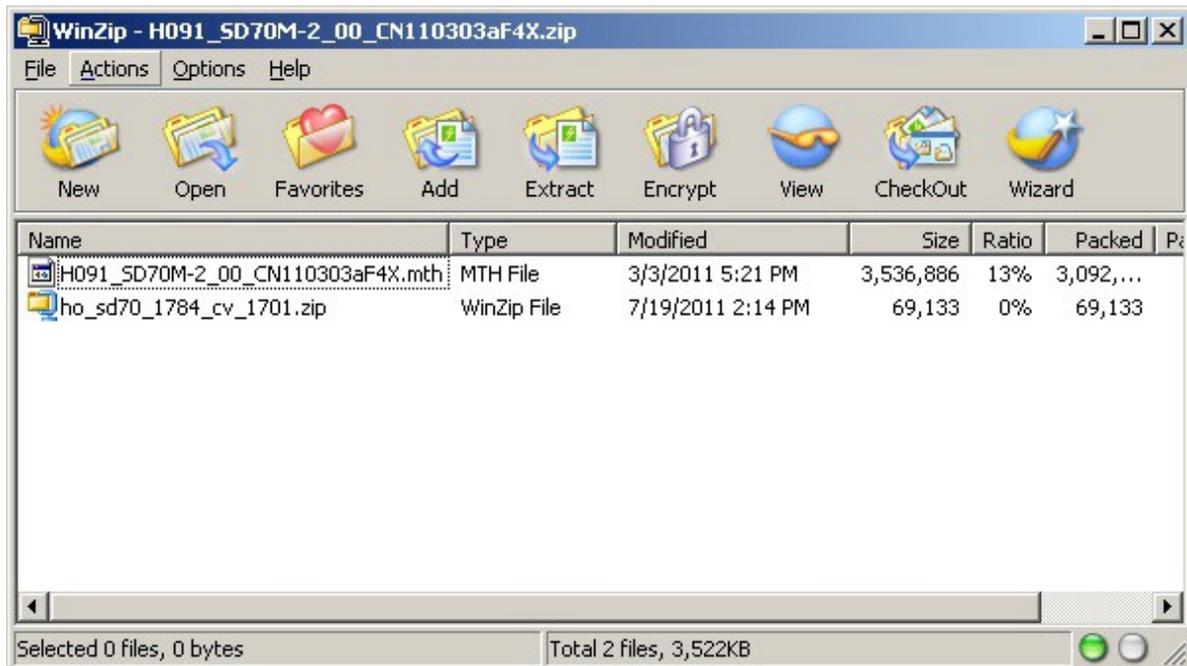
Which Engines Can I Load the Chain Code Files Into?

You can load the Chain Code Files into most PS3.0 & Protosound 3/2 Stacker equipped locomotives, be it O Gauge or HO.

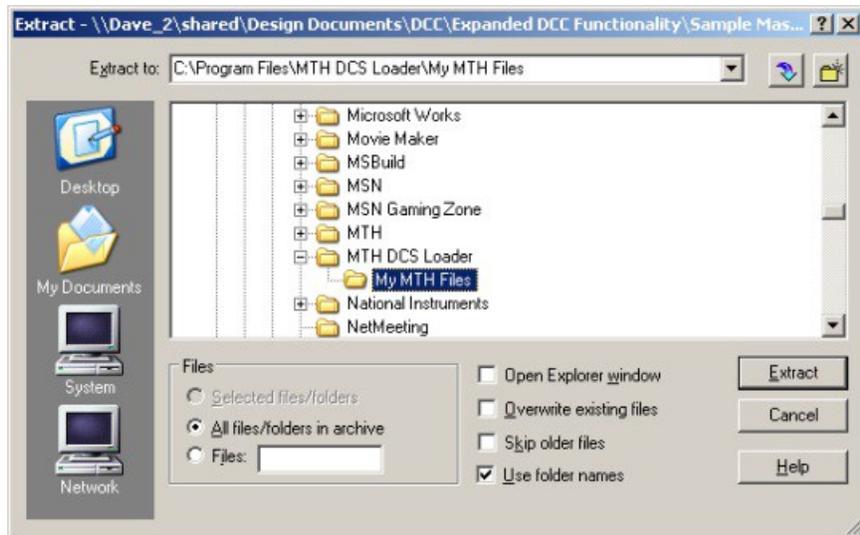


How Do You Save Chain Code Files To Be Loaded?

Once you download the main zip file from the MTH website you then need to unzip the file using Winzip or any unzipping utility. Once you do that you will see the following:



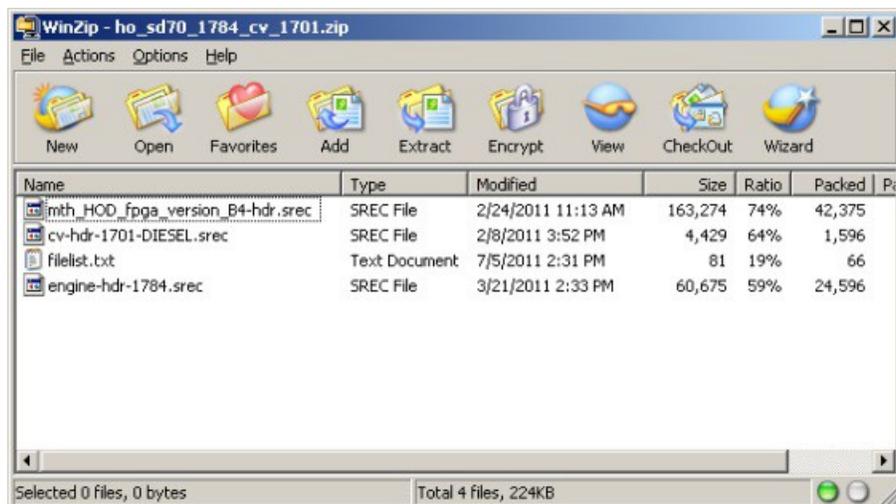
The first file you see in the list is the .mth file. That's your sound file. The second file you see in the list is another zip file. This is your Chain Code File. You DO NOT need to unzip that file. Simply extract the sound file (.mth) and the Chain Code File (.zip) to a folder of your choosing as shown below (it's recommended that you use the My MTH Files folder that is created when you install the MTH Consumer Loader program):



You now have your sound file (.mth) and your Chain Code File (.zip) all in one location. If you wanted to take it a step further you could create a folder for each engine type you have files for, that's completely up to you.

What Are In The Chain Code Files?

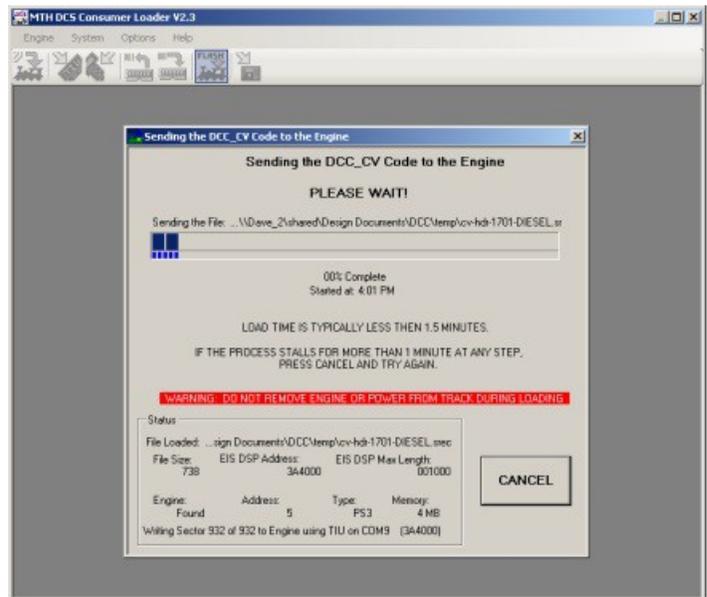
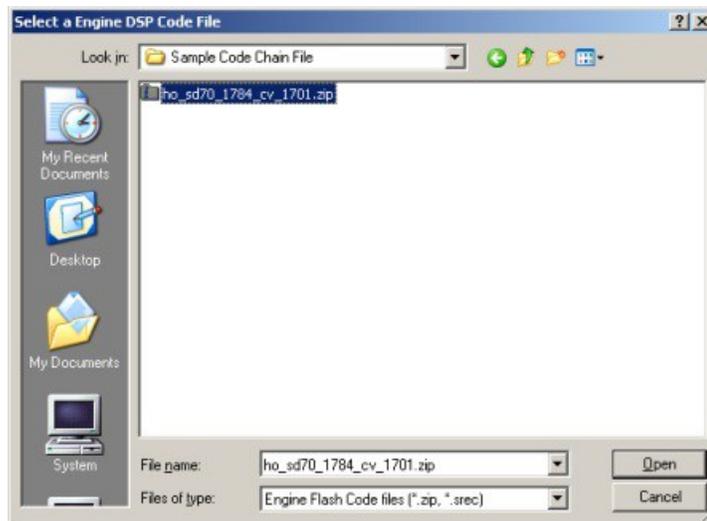
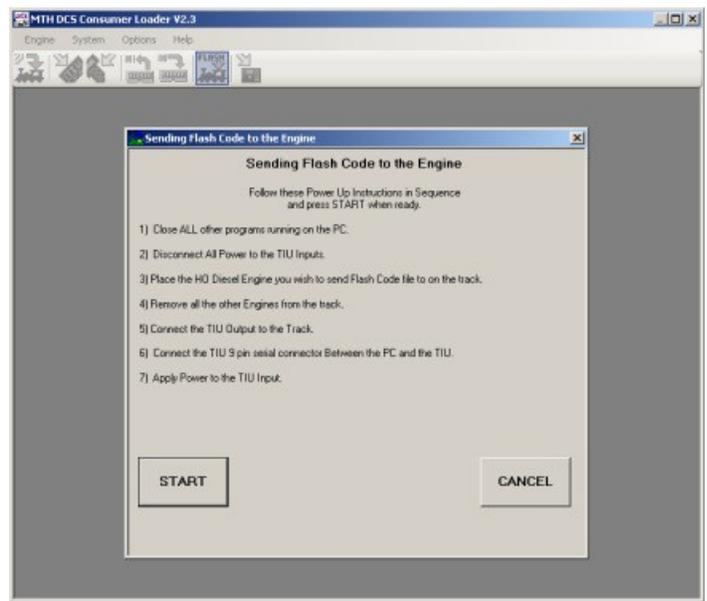
The Code Chain Files contain three or four files that have an .srec extension. This extension is used by the electronics inside the PS3.0 engine. The last file is a .txt file and that contains the filenames of the Code Chain Files to be loaded. The Loader looks at this .txt file to determine what must be loaded. However, when you load the files into the engine you only need to find the .zip file that contains the aforementioned files since the Loader takes care of all the work. You just point to the .zip file and the Loader does the rest. Below is an example from an HO SD70 Code Chain File .zip. Again, you DO NOT need to unzip the Code Chain File, just point the Loader to the .zip file and the



MTH's Loader version 5.0 now allows you to load chain code files into a Proto-Sound 3.0 engine right over the rails using a TIU running version 6.1 or later.

Loading Instructions for Chain Code Files

Below are a series of screen shots showing you step by step how to load a code chain file into an MTH PS3.0-equipped engine

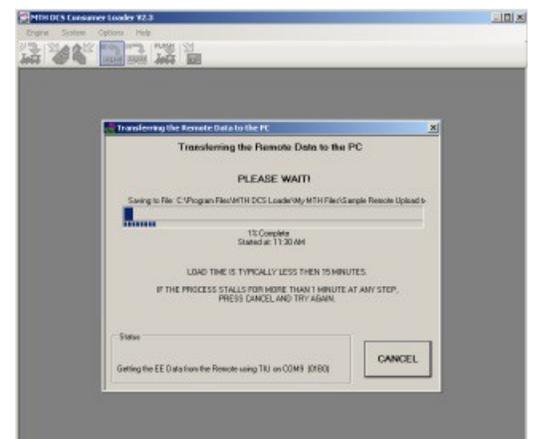
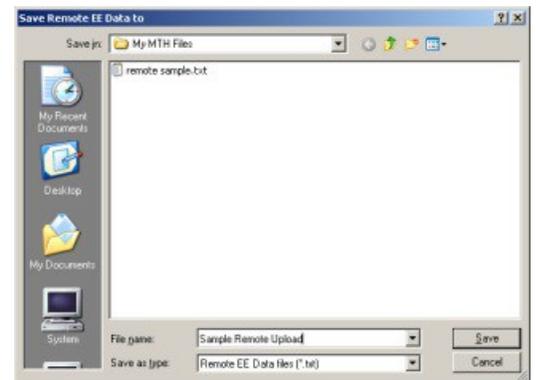
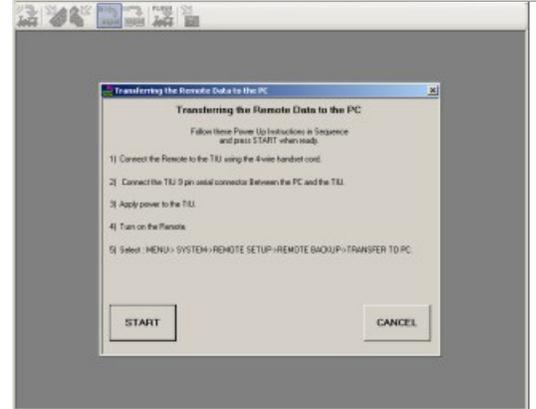


Transferring Remote Data to PC (Cloning)

Click on the Transfer Remote Data to PC icon or select **System** ->

1. Follow the on-screen instructions in the Loader program

2. When prompted by the Loader, you will need to give your remote file a name and a location to save it on your PC. The files are saved as ".txt".

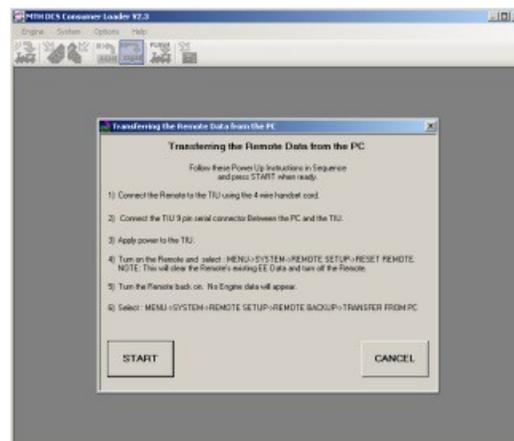


Transferring Remote Data From PC (Cloning)

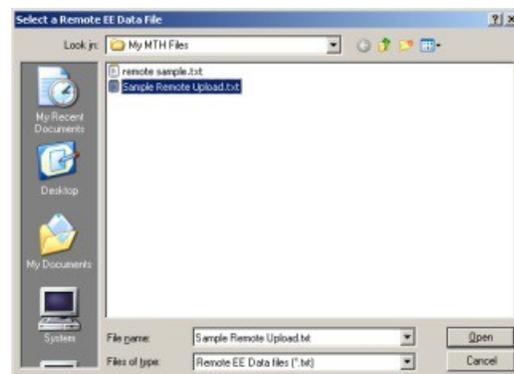
1. Click on the Transfer Remote Data From PC icon or select **System-> Transfer Remote Data From PC**.



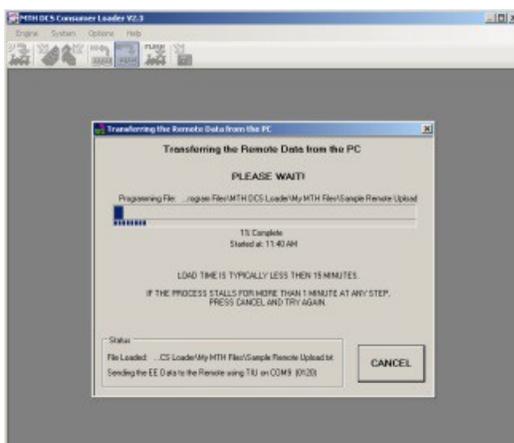
2. Follow the on-screen instructions in the Loader program.



3. When prompted by the Loader, you will need to retrieve your remote file on your PC. The Remote Clone files end with ".txt".



4. When the remote has been loaded with the clone file it will shut off.

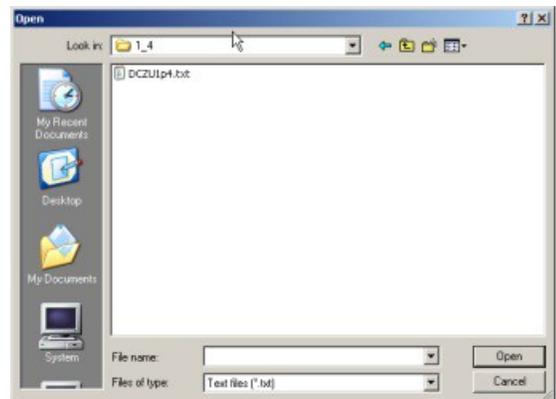
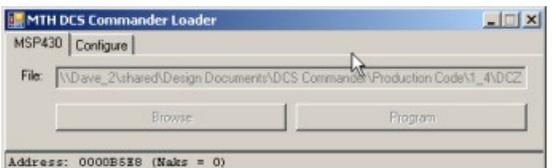
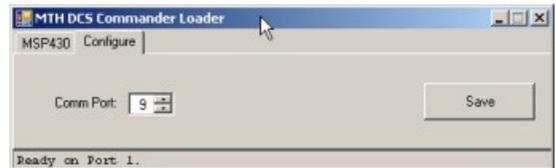
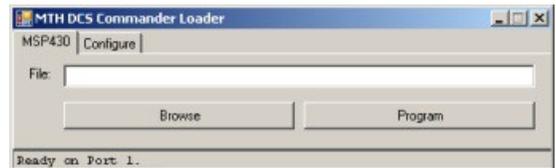


Loading DCS Commander Firmware

1. Download the DCS Commander firmware from MTH's website.
2. Connect your DB-9 Serial Cable or USB to Serial adapter to the PC and the DB-9 serial port on the back of the DCS Commander.
3. Connect your AC or DC supply to the Input voltage jack (either the barrel jack for a brick or the terminal jack for a conventional supply).

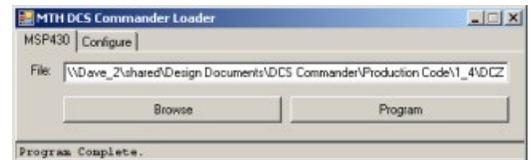
A. NOTE The LCD on your DCS Commander should be blank at this time.

3. Click on the Load DCS Commander Code Icon or select **System-> Send Code to the DCS Commander**.
4. Click on the DCS Commander icon in the toolbar.
5. Click on the Configure tab and select the Com port you have your DCS Commander connected to.
6. Click Save. The Loader will remember this the next time you need to update you DCS Commander or if you are doing multiple upgrades.
7. Click on the Program tab on the Loader.
8. Click on Browse and find the code file you downloaded from MTH's website (it's a .txt file).
10. Click OK.



Loading DCS Commander Firmware {cont'd}

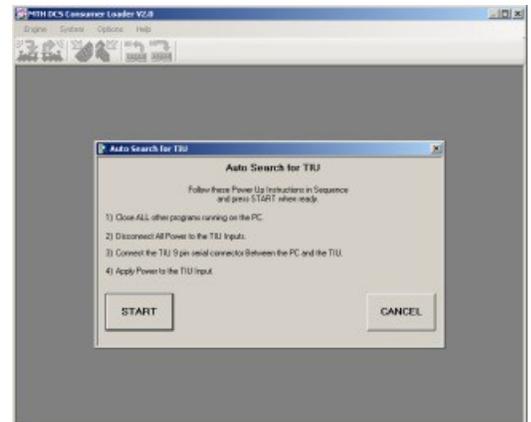
11. Now click Program on the Loader and the Loader program will begin sending the code file to your DCS Commander.
12. Once completed the DCS Commander will reset itself and display the code revision currently installed.
13. Remove the serial cable and turn off and remove your power supply connection.



Options

1. Click on **Options->Appearance**.
2. You can select to have Large or Small icons. By default the icons are set to Large.
3. Click on **Options->Serial Port**.
4. Here you can set the Loader to Auto-Search for a TIU or force it to a particular Com port.

*Note The Com ports listed under **Serial Port** are what the Loader views in your Device Manager in Windows. That is, only those Com ports that exist on your PC are the ones displayed.*



Help

1. Click on **Help->About** for the revision number of the Loader.

