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NEWSLETTER

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Current Central Station 3 Version – 1.2.0 (4)
Current Central Station 2 Version – 4.1.2 (3)
Current Mobile Station 2 Version – 2.5

Happy New Year!

We will now start a new series on upgrades. This first upgrade has been covered several times in the past, but this is for the readers who are new to digital operation and the Digital Club. So, in our first article, we will cover a simple upgrade. Even if you have limited experience with soldering, we urge you to try this project.

Our second article will continue with the basics of the Central Station 3.

Locomotive Upgrades – Getting Started

I received a Märklin 3167 (Ae 3/6II) from a gentleman that would like an upgrade (Fig. 1). This locomotive has had a previous upgrade from analog to digital and it received a 6080 decoder years ago, but retained the original three-pole motor (Fig. 2). Now, the owner would like to have a “high-efficiency” motor installed. Since a decoder and motor doesn’t cost much more than a motor alone, he decided on a 60760 high-efficiency upgrade kit, which is for a “drum-style” commutator motor in a locomotive.

Fig. 1 The chosen victim

This upgrade is perfectly suited for a 60760 high-efficiency upgrade kit since this locomotive has headlights only. The 60760 kit is inexpensive and contains everything needed to upgrade this locomotive.

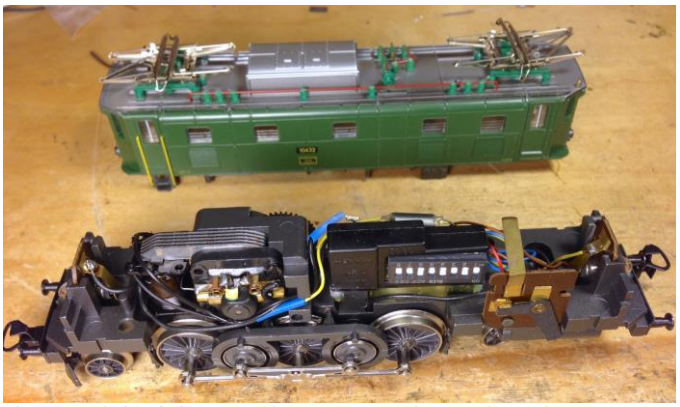

Fig. 2 Original three-pole motor and c80 decoder

I'd like to note that while an upgrade is being done, it's the perfect time to do any other repair/maintenance to the locomotive that might be needed. This is why you'll see the drive rods and side details removed in the pictures. This locomotive had so much oil under the slider contact and the pilot trucks, that the only way to clean it was a total disassembly.

Teardown

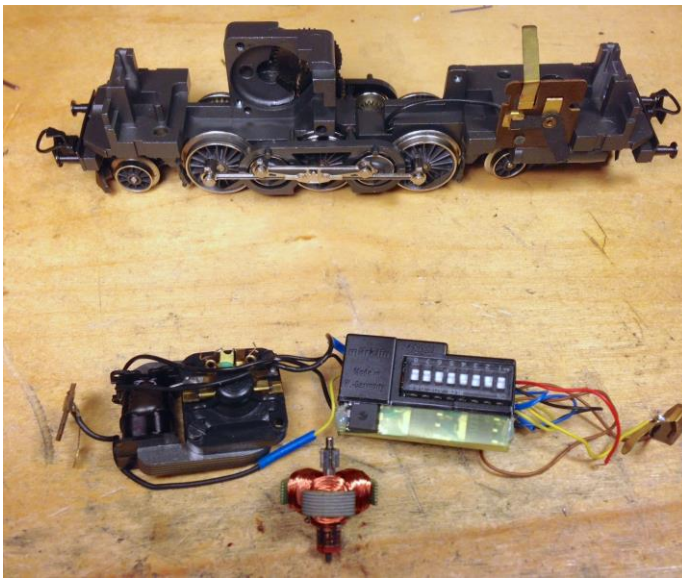

Fig. 3 Locomotive completely torn down

The first step is to tear down the components in the locomotive. Teardown is pretty simple: Remove everything you can inside the locomotive, including the motor, reverse unit or decoder, and light sockets (Fig. 3). When I do an upgrade, I also upgrade the lights to the low-voltage 2-pin bulbs.

Components

The 60760 upgrade kit contains a 5-pole motor upgrade (permanent magnet, armature and brush plate), motor chokes, brushes and a programmable decoder (Fig. 4).

The decoder is factory programmed to address 78, but can be changed to any address from 1-255. The decoder also allows for the minimum speed and top speed to be modified as well as the acceleration/braking delay. These parameters can be changed with the Mobile Station 2 and the Central Station 2 or Central Station 3.

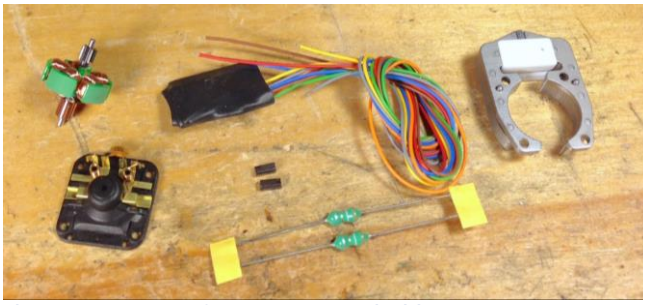

Fig. 4 Contents of 60760 upgrade kit

Motor Installation

Installation of all the components is pretty straightforward (Fig. 5). First, install the motor and find a suitable location for the decoder. Remember that the decoder should be attached to the frame with double-sided tape. If tape will not work, then a dab of silicone glue will do fine.

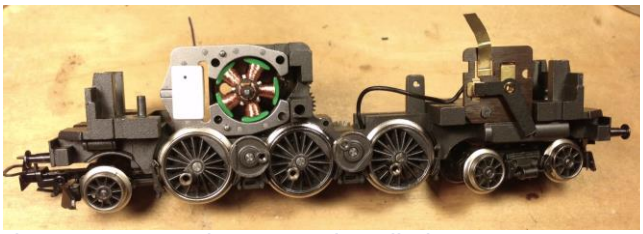

Fig. 5 Magnet and armature installed

With this motor upgrade, the original motor screws and ground tab are re-used on the new motor (Fig. 6).

This is a good place for a hint or two, and take it from my experience: You should insert your motor brushes now. After all the upgrades that I've done, I still forget to install the brushes, and then I wonder why the motor doesn't run when I test it. Also, remember to oil the motor now.

Light Socket Installation

There are basically two options for the lights. The original lights can be used, or new sockets can be installed. If the original sockets/bulbs are used, it can lead to the lights flickering because the chassis is used for the ground. This means that the digital code will interfere with the current, which makes the lights flicker.

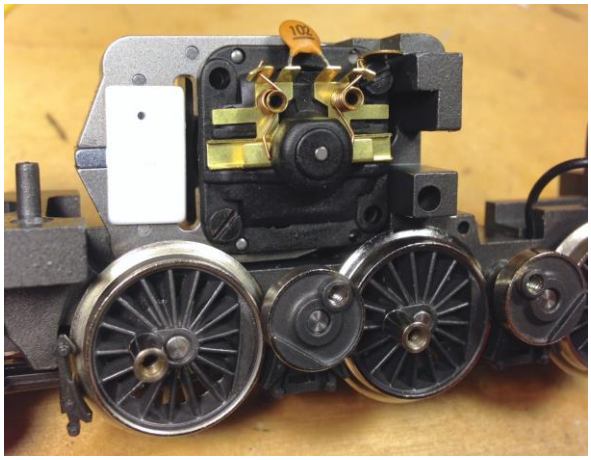

Fig. 6 Upgraded motor

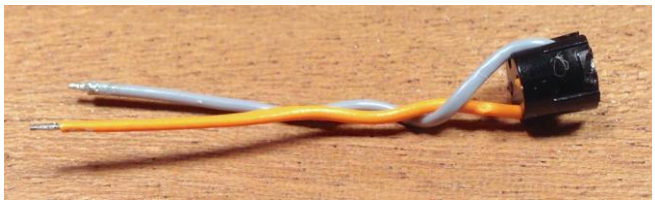

Fig. 7 Socket with wires, part #E276770

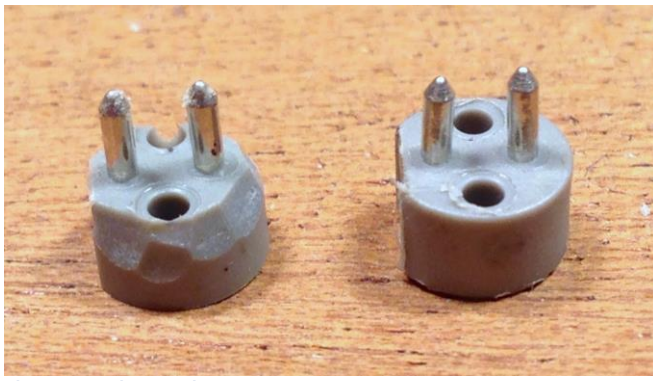

Fig. 8 Socket only, part #E604180

The second option is two-fold. Märklin offers two different light sockets. One light socket has wires soldered to it already and the other is just the bare socket with no wires. Both take the low voltage light bulb, part #E610080.

The socket with wires has a tapered body for easy installation: Part #E276770 (Fig. 7). The other socket has a cylindrical body with no wires and no taper. This makes it a little bit more difficult to install, but this socket is less expensive: Part #E604180. I use the socket with no wires because it is more cost effective and gives a cleaner look when it's installed in the locomotive. All I do is shave the base with a modeling knife to give it a small taper (Fig. 8). Then it gets pressed into the body. This gives it a very tight fit so there is no need for glue (Fig. 9 and 10).

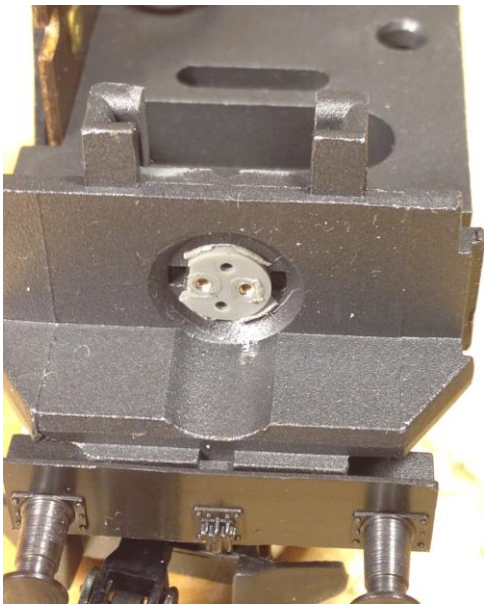

Fig. 9 Socket pressed in place

Fig. 10 Back side of socket installed

Decoder Installation

Now the chassis is all ready for the decoder and wiring. The decoder only comes with a single return wire for accessories. So, this means that both lights will need a return wire with only one available. Instead of a messy wire running from one light to the other, or a splice, I chose to remove the shrink tubing and solder another orange return wire to the decoder (Fig. 11). Note: This is not necessary if you are comfortable with a splice in the orange wire.

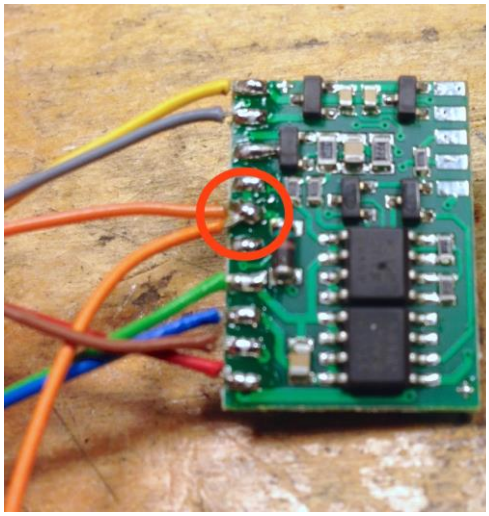

Fig. 11 Extra return wire soldered in place

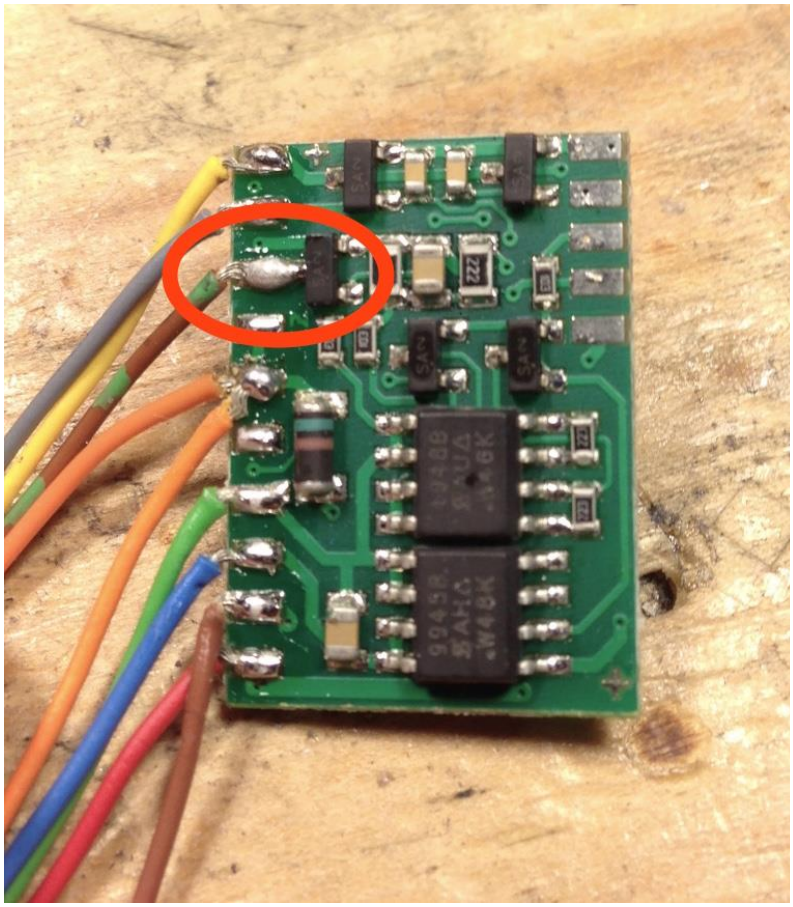

Fig. 12 New wire soldered on F3 function

Here is another hint: The 60760 decoder has an extra function that is not wired. It's "F3" on the controller. This is handy for a smoke generator or another accessory that someone might want to install (Fig. 12). This "F3" modification is not necessary for this upgrade; it's only for those who would like to use it.

Once I have my extra return wire soldered, I re-shrink tube the decoder.

After I “rough in” the decoder, I’ll solder the red wire to the “slider contact.” I usually take the trouble to remove the original slider wire and then solder the red decoder wire to the slider contact itself. This way there is one less point of failure. After that, I solder the brown wire to the motor ground. Both wires (red and brown) were cut to length before soldering.

The motor ground is the brass tab on the motor brush plate. Usually on electric locos with two trucks, a chassis ground to the frame is also needed because the motor frame usually has two or more traction tires.

Next, I’ll solder the light socket contacts. The grey wire is the “forward” light while the yellow wire is the “reverse” with an orange wire going to each. Since I know where the decoder will be placed, I can cut the headlight wires to length and solder them.

Now comes the motor contact. This is tricky because if the wires are wrong, the motor will run in the reverse direction and the light will be on in the forward direction. I solder the two chokes to the motor contacts, leaving a long tail to “test” solder my motor wires (Fig. 13). The motor wires are the blue and green ones. Solder one to each. As a rule, I generally solder the green wire to the “forward” side of the motor. For some reason I didn’t do that this time, and the motor ran backwards (Fig. 14).

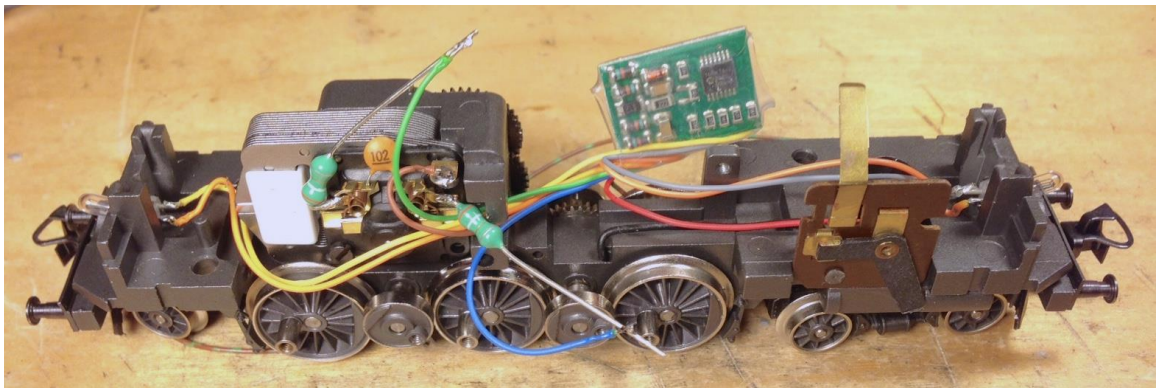

Fig. 13 Wires installed and “test” soldered to the motor chokes

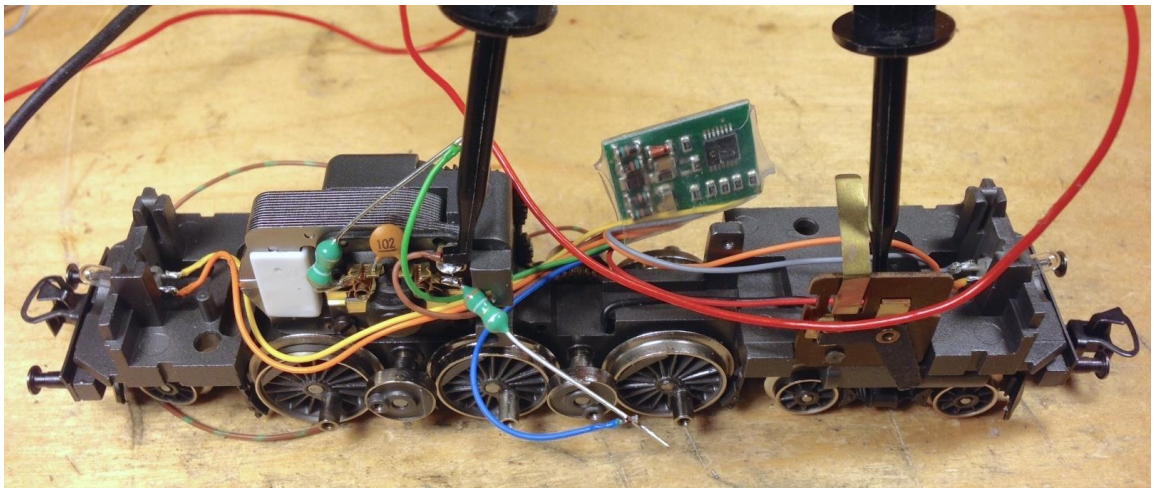

Fig. 14 Test the motor direction and lights – motor runs in reverse

Now that I know the decoder works and the motor wires need to be reversed, I can cut the motor wires to length and solder them in place (Fig.15)

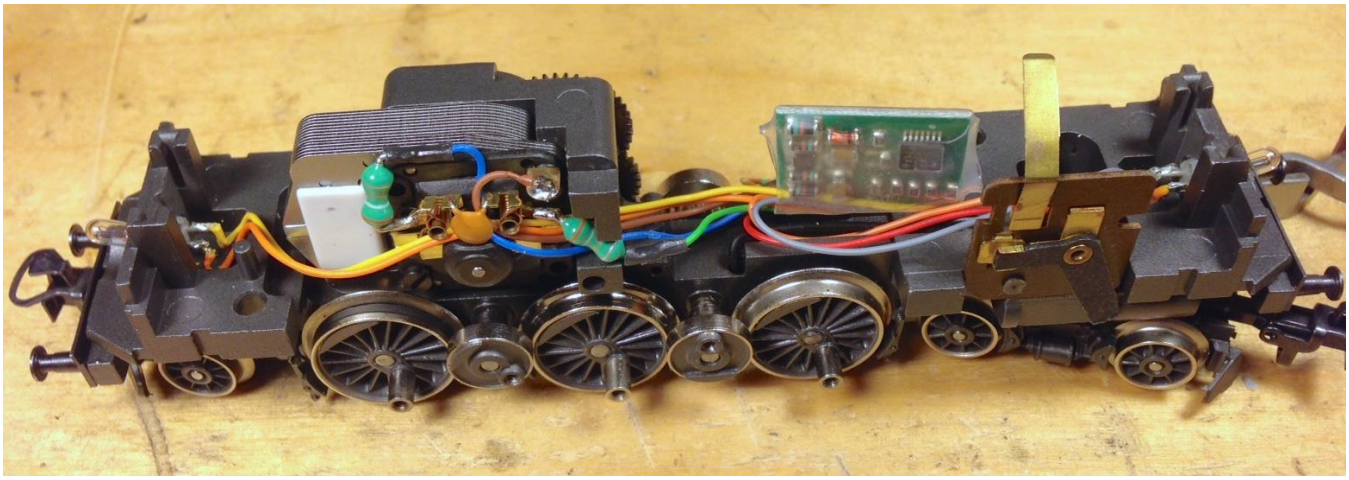

Fig. 15 Motor wires cut to length and soldered to run in the correct direction

I will use two-sided tape to secure the decoder and tie the decoder wires down with leftover wire for that “neat and clean” look (Fig. 16).

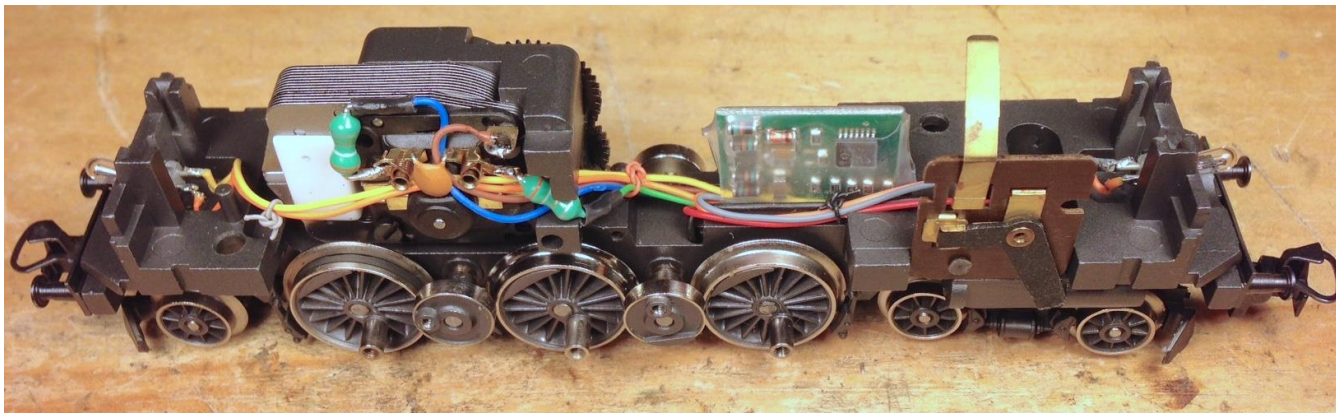

Fig. 16 Decoder wires bundled and tied neatly

Fig. 17 The final test – PASS!

I can now fit the body back on paying attention to the new lights that were installed. Also, be very careful not to “pinch” a wire between the chassis and the body. This could permanently damage the decoder. This is why it is a good idea to bundle and tie the decoder wires inside the locomotive. One final test, and it is back to the owner for service on his layout (Fig. 17).

The lists of parts that I used are:

1 – 60760 Hi-efficiency propulsion kit.
2 – E604180 light sockets or E276770 sockets with wires
2 – E610080 light bulbs
1/16” diameter shrink tubing for wires
1/2” shrink tubing for the decoder

Here is a wiring diagram that might be useful. It's the same diagram you will find in the instruction manual, but this one is in color (Fig. 18).

1. Yellow wire – Rear light
2. Grey wire – Forward light
3. Orange wire – Function Return (light)
4. Green – Motor contact
5. Blue – Motor contact
6. Brown – Chassis/Motor ground
7. Red – Pick-up shoe (slider or catenary/slider switch)

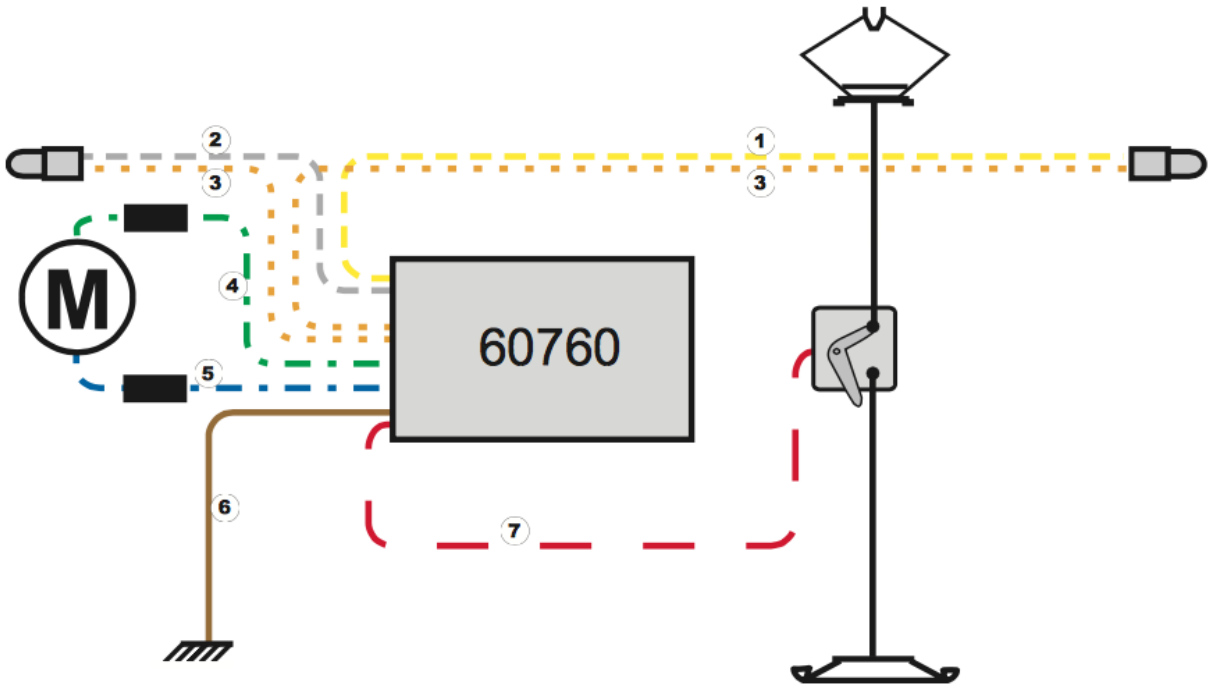

Fig. 18 Wiring diagram

Enjoy your hobbies!

Rick Sinclair

Multiple Central Stations
Master and Slave Connections

For those who have been looking forward to adding a Central Station 3 to your layout, and already have the Central Station 2, this article will explain how to connect the two together to expand your control access to the layout. I will also discuss what needs to be done if you will be using two or more CS units, including multiple CS3s, multiple CS2s, or a CS2 with a CS3. To simplify things, I will cover the concept of the master/slave relationship, various control devices, hardwire connections, and finally track connections.

The Master and Slave Relationship

It is simple to imagine a single CS used to control a layout, because it is the master controller to every input into your system. Adding another controller to the layout cannot change the concept of a master controller. There needs to be a single system to coordinate all the commands put out by other devices. Therefore, we have to establish a master and slave relationship between multiple control devices. Another way to look at it is, when adding another controller to the system, consider it as an auxiliary device that slaves itself to the master controller of the layout. Once the relationship is understood, then we can move on to viewing how different controllers can be used.

Various Control Devices

Initially, I had planned to explain the master/slave relationships with only the Central Stations (2 and 3) in mind. However, I thought it might be a good idea to expand that to include the Mobile Stations (2 and 3). In Table 1, I illustrate how the main controller (top row, in bold) is listed as the master, and the connected unit (left column in italics) is defined as a slave in each relationship. The first important thing to notice here is with a combination of a CS2 and either of the CS3 units, the CS3 must always be the master controller. The second important thing to notice is that the CS3 (60226) can ONLY be a master (highlighted in yellow), whereas the CS3+ can be only be a slave controller, when connected to another CS3 (highlighted in green).

	MS (2 or 3)	**CS2 (60213-60215)**	**CS3+ (60216)**	**CS3 (60226)**
MS (2 or 3)	MS master/ MS slave	CS2 master/ MS slave	CS3+ master/ MS slave	CS3 master/ MS slave
CS2 (60213-60215)		CS2 master/ CS2 slave	CS3+ master/ CS2 slave	CS3 master/ CS2 slave
CS3+ (60216)			CS3+ master/ CS3+ slave	CS3 master/ CS3+ slave
CS3 (60226)				Not Applicable

Table 1: Control device master/slave relationships

Hardwire Connections
CS2 Slave Connection to Any CS

In setting up the master and slave connection, we have discovered that not all connections are the same. When setting up a CS2 as an auxiliary (slave) device, it requires the connection cable [part # 60123 – a 9-pin to 6-pin (w/ vertical tab) cable]. The 9-pin and 6-pin ports are part of the CAN bus used in the Central Station. Fig 1. Illustrates the icons and locations of the CAN bus ports on your CS. To connect a CS2 as a slave to any other CS,

you plug the 6-pin plug into the slave unit and connect the 9-pin plug into the master controller.

I have marked the icons for each purpose. The red outlined boxes indicate the Master connection icon, or as described in the manual “Marklin CAN Bus output.” The blue outlined boxes indicate the slave connection icon (“CAN Bus input”). Personally, I find the Märklin descriptions and icons easy to confuse. I realized the smaller pin count (of the 9-pin to 6-pin connection) is easier to remember as the slave unit connection, i.e. 6-pin is the slave connection.

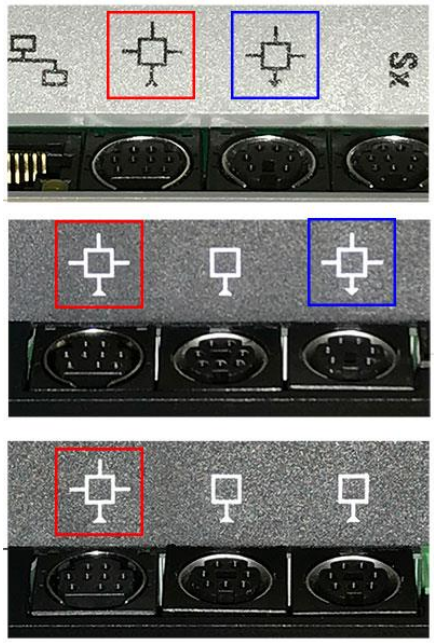

Fig. 1- CAN bus icons master (red), and slave (blue) connections; CS2 – top, CS3+ - middle, CS3 - bottom

CS3+ Slave Connection to Any CS3

If you are using a CS3+ as a slave (remember, the CS3+ can only be slaved to another CS3), you do NOT need part #60123 for the master/slave connection. There are items you will need when connecting two CS3s together: ethernet cables (network cable) with RJ-45 connections at each end, and a network router. While it is okay to use a simple network router, it would be better to connect to a wireless router instead. Both the master and slave controllers will need to be connected to a LAN port on the router in order to establish the master/slave connection. The reason it is best to use a wireless router is simply for future expansion into wireless control using any Mobile device that you may already have. (*Note – You will not be able to use your existing Märklin MainStation or Märklin Mobile Station application with the CS3. It will only work with the CS2. At the time of this writing, the development of Märklin’s mobile control apps for the CS3 is still in progress.)*

The master/slave connections for any (and only) CS3 units just need to use the Ethernet port on each device. You may be wondering why the CS3s have the CAN bus connections if they only need the Ethernet port to establish the master/slave control setup. I will explain this later in the article, but for now, this is all we need for the hardware setup, and we can move on to the CS configurations to make it all work.

Software Configurations – Setting Up the Connection

Setup with the Central Station 2

Configuring the CS2 to operate as a slave is relatively easy. You will need to enter the Setup > configuration screen, and view the ‘CS’ page. Fig. 2 shows the ‘CS’ screen and displays the ‘Auxiliary Device’ checkbox. By checking this option, the CS2 will reveal four additional checkboxes (Fig. 3).

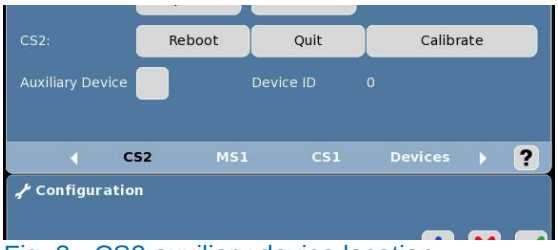

Fig. 2 - CS2 auxiliary device location

The 4 check boxes are the ‘Synch with Master’ items. Selecting these items will poll the master controller to be sure they are active in the slave unit. If you do not check these items, they will not access the information stored in the master. For example, if you do not select the keyboard or layout check box, you will not be able to control these devices from the slave. They will only be controlled on the master controller. This is an ideal feature if you would like, for instance, a yard master to have strict control of a switch yard. Otherwise, you can select all four options for complete control of the layout.

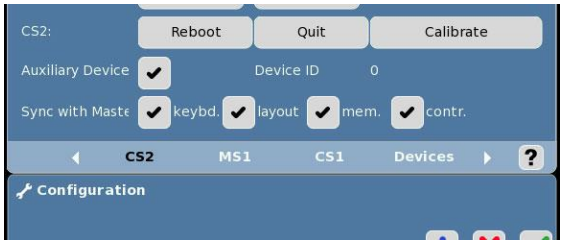

Fig. 3 – Slave’s synchronization settings, syncs to master controller

These checkboxes are available at any time you are in this configuration screen. One thing to note, is you may have to re-start your Central Stations as the activation may be dependent on the startup of your control units.

Setup with the Central Station 3 plus

To set the CS3+ as a slave you will need to look into the CS3/CS3-1 panel. Open the ‘Master slave’ section by clicking on the triangle icon next to the name. Fig. 4 shows that the ‘Master slave’ information is revealed by the downward pointing triangle.

Fig. 4 - CS3+ master slave settings

The first textbox will require the IP number from your designated master controller. To view the IP from the master, go to the same screen as shown in Fig. 4, but click on the ‘IP’ section instead of the ‘Master slave’ section. If you are unfamiliar with how to see or need to set the IP, please refer to the Vol 28, number 6 issue of the Digital Club Newsletter. An example IP number is in the ‘Master IP’ box.

The IP requirement is why the master/slave is different on the CS3+, rather than from the CS2 connection. The 60123 Cable needed for the CS2 does not supply a Master IP number, therefore the Ethernet connections are needed. One advantage of this is now you are permitted a longer distance between master and slave locations.

Once you have entered the master IP number, you can designate the slave device by checking the ‘Secondary Device’ checkbox. A dialog box will appear declaring that you are setting the device as a slave unit and stating that it will activate after a restart. The CS3+ will then reboot. During the reboot, a dialog box will appear in German (Fig. 5), and you may go ahead and okay the process.

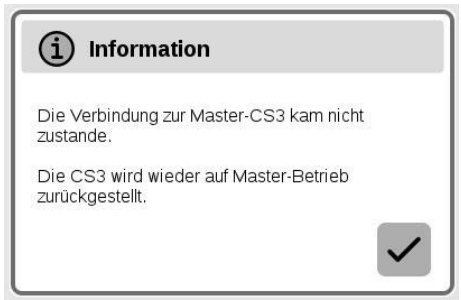

Fig. 5 - CS3+ slave setup information box during reboot

Once the CS3+ has restarted, you can go to the CS3/CS3-1 panel and review the ‘Master slave’ section. The ‘Secondary Device’ checkbox will now be checked. Your CS3 is now in slave mode to the master controller. Unchecking this box will reboot the CS3+ and remove it from slave status.

This is essentially all you need to do to set up your Central Station slave units, when combining two Central Stations together. However, in the interest of somewhat unexplored potential of your Central Stations, please read on to the next section. It relates to some of the wiring that I have already discussed in this article.

Central Station Slaves, the Overlooked Booster Connection

This section pertains to CS3+ and CS2 (hardware version 4.0 or greater)

Up until recently, when reading the descriptions on some of the new Central Station releases, there had been mention of CS being used as a Booster. Mostly, we overlooked this little detail, because there was not much follow up on what this meant. Additionally, this was never explored because of an already working network of Boosters (60174) on the layout. This piqued our curiosity and we did a little exploring. You’d rather we blow up our CS units instead of blowing up yours, right?

If we were going to test some relative unknowns (to us anyway), we were going to start off slow and with older equipment. WARNING* - Be sure you follow the proper track isolation procedures that you would with any other Marklin booster device (e.g. 60175, 60174, 6017, 60150).

Test One, CS2 slave booster

Hook up the CS2 slave unit to some track. This involves connecting the track output of the CS2 to some loose track off the layout. Remember that the CS2 is wired as a slave unit to another master.

Test one result: success! The CS2 was able to control a locomotive placed on the track. It was also able to activate turnouts and signal switches when we connected the track to the layout.

Test Two, CS3+ slave booster

Hook up the CS3+ as a slave as described in the previous sections. Hook up the track output on the slave CS3+ to our isolated track piece.

Test two result: nothing. No control signals were being sent to the locomotive. BUT, the control signals were still being transferred over to the master controller, as would be expected in our traditional layout connection, where only the master was connected to track.

Why didn’t this work?

We had to give the failure of test two some thought, and analyze what was different with the master/slave connections between the two CS devices. The CS2 would slave when connected to the 60123 cable. The CS3 would not slave with the 60123 cable, and required the use of a network connection.

Test three, getting the CS3+ slave to work as a booster:

Connect both a 60123 cable AND an Ethernet cable to the master and slave.

Test three results: success! It only took us a minute to realize the 60123 cable is the connection to access the Central Station's CAN bus, in order to transfer control data from one machine to the next. This is also a requirement of 60175 booster devices. However, in order to slave the data from the master controller, you will still need to use the Ethernet connection to share layout control. Therefore, you will need to have two connections from the CS3+ to the master CS in order to use it as a booster.

Our Responsibility

You may be concerned that these tests are fine and good, and I wouldn't blame you for being cautious about such hookups. It would be irresponsible for us to let you make these connections without some validation. Therefore, we sent an inquiry to the good folks in Germany (many thanks Frank), asking if this was an approved method of connection.

To our satisfaction, we were told connecting a slaved CS as a booster was allowed. This did have restrictions with regard to using the Central Station 2 as a booster. The CS2 MUST be of hardware version 4.0 or greater.

The benefit of using a Central Station as a booster is a nice way to expand your power supply to a growing layout. It can allow you to free up an existing booster unit, if you have need of it elsewhere. Adding this feature to a slave unit creates a nice access point of control, especially if you are a growing railroad tycoon.

Curtis Jeung

Upcoming appearances:

Rocky Mountain Train Show
Denver Mart
451 E 58th Ave
Denver, CO
March 4-5, 2017

National Garden Railway Convention Train Show
Renaissance Tulsa Hotel & Convention Center
6808 S 107th East Ave
Tulsa, OK
July 15, 2017

EuroWest
Hiller Aviation Musuem
601 Skyway Rd
San Carlos, CA
July 22-23, 2017

Trainfest
Wisconsin State Fair Park Expo Ctr
West Allis (Milwaukee), WI
November 11-12, 2017

Summary of Newsletter Articles

Heading into the New Year, we'd like to give you a quick reference to our previous articles. When we started to write the Digital Club Newsletters in 2015, we were only able to complete three that year. They are included in the summary table below. For a slightly more categorized table, send us an email, and we'll send you a link with references to specific product mentioned in each article. In the future, we hope to categorize some of the wonderful articles written by our predecessor, Dr. Tom Catherall.

Title or Topic	Edition (Vol. & No.)	Month, Year	Author
2015			
How to Install Custom Icons in the Central Station 2	27 - 1	July - Aug - 2015	Rick Sinclair
Track Planning Your Layout for Digital Automation	27 - 1	July - Aug - 2015	Curtis Jeung
mfx Signal Setup and Features	27 - 2	Sept - Oct 2015	Rick Sinclair
Wiring - Track Sensors	27 - 2	Sept - Oct 2015	Curtis Jeung
Wiring - S88 & L88 Feedback Modules	27 - 2	Sept - Oct 2015	Curtis Jeung
Central Station 2 Overview and Setup	27 - 3	Nov - Dec 2015	Rick Sinclair
Updating the Central Station 2	27 - 3	Nov - Dec 2015	Rick Sinclair
Automation, Layout & Memory Pages	27 - 3	Nov - Dec 2015	Curtis Jeung
2016			
Central Station Basics - Locomotives	28 - 1	Jan - Feb 2016	Rick Sinclair
Memory Scripting Events	28 - 1	Jan - Feb 2016	Curtis Jeung
mfx Locomotives not Found	28 - 2	Mar - Apr 2016	Rick Sinclair
Basics - Digital Decoders	28 - 2	Mar - Apr 2016	Rick Sinclair
Distance Signal Update	28 - 2	Mar - Apr 2016	Rick Sinclair
Memory Scripting Events 2	28 - 2	Mar - Apr 2016	Curtis Jeung
Mobile Station 2 & 3 (pt 1)	28 - 3	May - Jun 2016	Rick Sinclair
Troubleshooting and Entering Locomotives	28 - 3	May - Jun 2016	Curtis Jeung
Layout - Blocks, Signals and Braking Modules	28 - 3	May - Jun 2016	Curtis Jeung
Mobile Station 2 & 3 (pt 2)	28 - 4	July - Aug 2016	Rick Sinclair
Setting up Märklin Mobile Apps, Mainstation and Mobile Station	28 - 4	July - Aug 2016	Curtis Jeung
Turnout Motor and Decoder Installation	28 - 5	Sept - Oct 2016	Rick Sinclair
Automating Passing Lines	28 - 5	Sept - Oct 2016	Curtis Jeung
Modifications - Big Boy Lights to White	28 - 6	Nov - Dec 2016	Rick Sinclair
CS3 Updating	28 - 6	Nov - Dec 2016	Curtis Jeung
CS3 Transferring Data from CS2	28 - 6	Nov - Dec 2016	Curtis Jeung

To contact Curtis and Rick for help with your Digital, technical and product related questions:

Phone: 650-569-1318 Hours: 6:00am – 9:00pm PST. Monday through Friday.

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