System Upgrade Highlights

- Restructuring of system architecture to optimize wireless and plug-in throttle performance and response time
- Full support of all 13 NMRA-DCC Functions from the CS2B, RF1300 and T9000E throttles.
- Changed throttle IDs to dedicated range of 1 to 31 for faster system response
- Added new diagnostic command to show all active throttle IDs
- New method for updating active locomotive speed and functions for faster performance
- Implemented new scheme to allow "stealing" locomotives after 2 minutes of non-activity.
- Restricted Emergency System Stop to be invoked only at the Command Station
- Emergency Stop command removed from the wireless and plug-in throttles
- New command to monitor a throttle's data when given it's ID number
- Significant changes to Installation and Operation Manual now includes quick start section for new users
- Allow use of multiple wireless receivers and eliminated the need for specialized secondary receiver software
- Default speed steps for all newly registered locomotives is 28
- Throttle A default is now unassigned
- Address 0 no longer allowed since it is rarely used and significantly decreases system performance
- Throttles communicate with the command station only if they have a change in data to report\
- Wireless Basestation software developed for dedicated wireless throttle ID numbers of 1-to-8 or 9-to-16
- Wireless receiver switch settings redefined to balance the Scan mode options (Scan-2,4,6, and 8).
- Special wireless receiver software is available to allow communication with the older 5-function wireless throttles
- Command station now shows the immediate number of active throttles and the number of registered locos
- A new fail-safe feature was installed which to prevent any loco 'stuck horn', regardless of cause
- The command sequence SHOW R ENT was added to show all active (responding) throttle ID numbers
- Changed wireless throttle factory defaults and plug-in throttle default to new IDs
- Added new Restore Factory Default Command to plug-in and wireless throttles: #, DIR, 0.
- Expanded tutorial on how to customize Advanced Consists function response.
- Removed Queue and DeQueue from the RS232 command set due to their resultant system delays even if not used
-

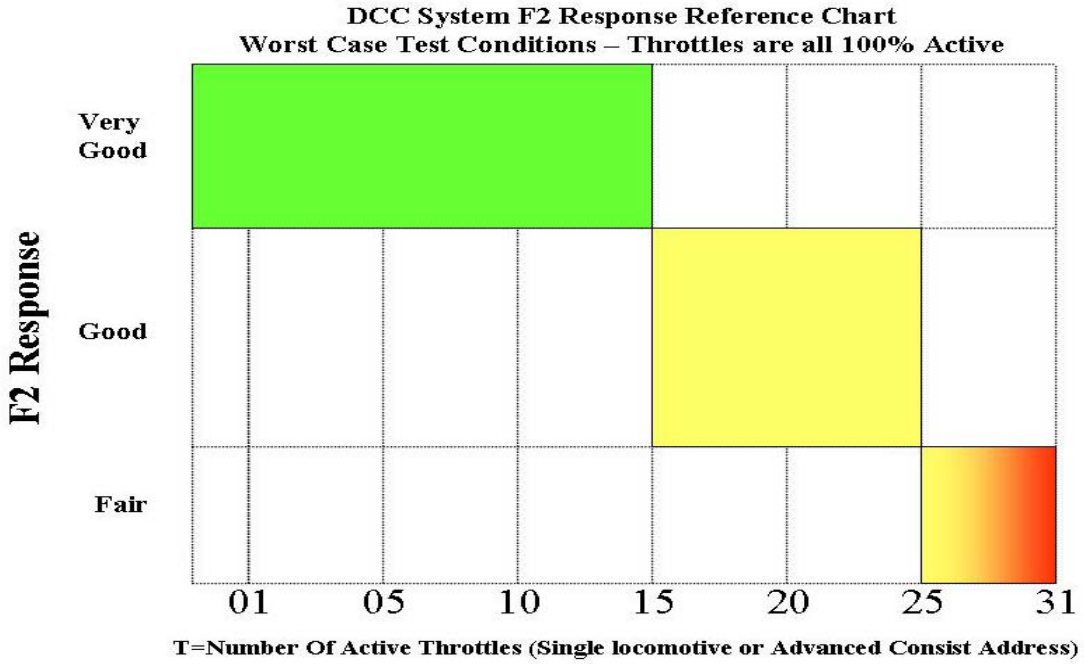
New Software Required For All Equipment When Upgrading

- Command Station – all versions
- XR1300 Plug-In Throttle
- Primary and Secondary Wireless Receivers
- RF1300 Wireless Software
- T9000E Wireless Software

Maximizing System Performance

The EasyDCC Command Station is very busy handling all of your layout's locomotives and turnouts. The new system architecture and software, plus extensive testing have allowed us to test and subsequently recommend the best several methods with which you can manage the overall system performance. Before getting into the various system optimization options, the following items guidelines should be followed since the directly impact the overall performance and are independent of whatever option is selected.

1. **Use only advanced consists.** Standard consists will drastically slow system performance.
2. **Don't use the programming track during group operation.** The moment the programming track is activated, the mainline trains will not receive throttle commands and will continue operating with the last issued command until the programming task is completed. For some programming sequences, it can be several 10's of seconds before programming is completed and throttles and locomotives resume normal operation.
3. **Always set the Command Station's default speed step setting to the desired value**. This insures proper speed step matching for new locomotive addresses. Use the SETUP #STEPS command.
4. **Setup throttle A and B for no addresses.** SETUP A (or B) ENTER. Display will show dashes.
5. **Delete unused or bad locomotive addresses**. Review the memory slots (SHOW LOCO ENT) and press the 0 key to unregister bad locomotive addresses or addresses that are no longer used. Press ENT to move to the next locomotive address.
6. **Assign plug-in and wireless throttles to a common and unused address before unplugging or turning them off.** This automatically allows another throttle to gain control without having to wait for the two minute timeout.
7. **Plug-in throttles will always have the fastest response** since they have a hardwired connection to the command station.
8. **Wireless throttles have several new performance optimization settings.** The next section discusses these options in depth. In most cases, performance is a compromise between the number of wireless throttles and the number of wireless receivers. The best case performance is where each wireless throttle has its own receiver. The worst case performance is where a single frequency is shared by many wireless throttles. However, the latter is the cheapest solution since only one receiver is needed.
9. **Sound Decoders also have inherent delays.** As we tested the new system, we discovered that sound decoders all have their own delays, especially for horns and whistles. This is done in part to insure that sound decoders don't inadvertently sound their horn or whistle as a result of bad commands caused by dirty track or dirty wheels. Thus some decoders require a longer than normal press on the F2 key before the horn actually sounds.
10. **The NMRA-DCC** standard is a relatively slow method to send locomotive information over the rails because this information is sent sequentially, one locomotive at a time. Common sense says that as more active locomotive addresses are added, the time delay to service each active address increases. Although we have implemented several novel schemes to minimize delays, there is a limit beyond which the protocol itself dictates the amount of delay. The graph below is a simplistic representation of the F2 response delay that can be expected from your system as more active locomotive addresses are added. This graph, combined with your selection of a wireless throttle option, will provide an overall sense for what type of F2 response to expect.



Wireless System Performance Optimization

Optimizing Wireless Performance - Introduction

EasyDCC wireless throttles can be configured in several different ways with each way having pros and cons. The most fundamental compromise is between cost and performance with cost driven by the required number of wireless receivers needed to provide the desired response time.

Wireless throttle response time is a measure of the amount of time it takes to send a user initiated command to a specific target locomotive or consist address. Short amounts of time are good. Long amounts of time are not so good. For example, you push F2 on the wireless throttle to turn on the locomotive's horn and then you wait for the horn to sound. Pushing a button, and waiting for the function to activate, takes a certain amount of time. The time delay allows you to evaluate your wireless throttle performance.

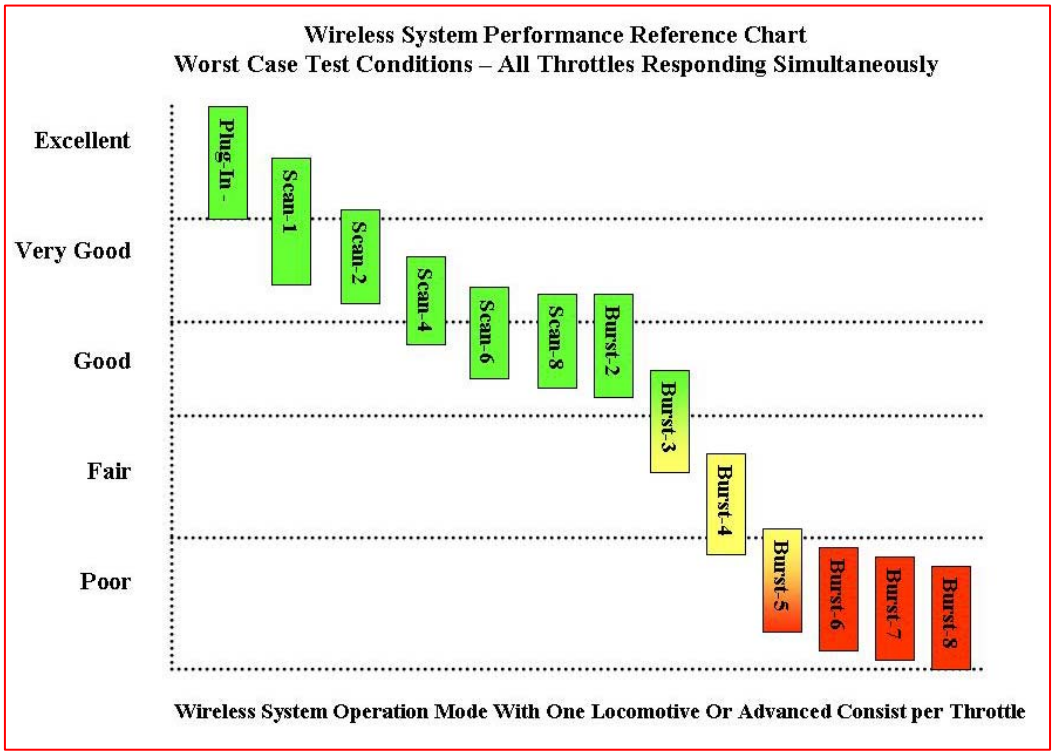
In addition to response time, other aspects of wireless control response include range, missed or jammed signals and how many wireless throttles are being used simultaneously, how many plug-in throttles are being used simultaneously, and how many addresses are in a standard consist that each throttle is actively controlling. All of these factors go into establishing the overall wireless throttle performance. The key words are simultaneous and active.

The EasyDCC wireless throttles now have several tested options to control and manage their performance. This section is written such that the best of the many possible options are shown and explained. Please try any or all of them. You can not damage or hurt any of the EasyDCC components so feel free to experiment because only you and your layout operators can decide what works best for your mix of mainline and switching operations.

Wireless Throttle Performance Defined and Measured

A significant change from previous EasyDCC wireless throttle software is a new architecture and methodology which minimizes the number of times a wireless throttle sends commands. This new methodology allows for much faster wireless throttle response time especially when the F2 function key is pressed. In conjunction with having pre-defined ID numbers for wireless throttles, this new system architecture has resulted in much faster operation for the throttle commands that must be processed and sent out onto the track.

We have extensively tested the new architecture and fine tuned its operation and options. Because the new software allows many wireless throttles to be in use at the same time without encountering increasing delays, we thought it would be a good idea to test the system in the worst case conditions possible when all wireless throttles are transmitting simultaneously.



This scenario is how this performance graph was created. We started with a single wireless throttle and one of the wireless setup options. Then we added additional wireless throttles, one at a time. We measured how long it took for an F2 ON/OFF command to be received by the test locomotive. More throttles were added until the limit was reached for that particular option.

This is truly the worst case condition – all throttles active and simultaneously sending commands.

The resulting graph is a great tool for you to use to select your desired wireless throttle setup. The graph also shows the plug-in throttle as a reference. It will always have the best response simply because it has a hard-wired connection back to the Command Station. But the Scan-1 mode is very close. See the next section for explanations of the various modes along with the limitations.

Because the response tests are worst case, you may discover that what we label as poor is actually good enough for your railroad and your operators. This will be because your operation doesn't cause a lot of data to be generated by a wireless throttle. In fact, it is possible that your throttle response time, for your particular type of operation will be good to very good whereas the graph indicates the response will only be fair.

Our test results, coupled with your style of operation and the number of throttles in use on your railroad will allow you to select the best compromise between numbers of wireless throttles in use and the worst case response time you can expect.

For example, say you have selected Burst-4 which is one wireless receiver servicing 4 wireless throttles all on the same frequency. If only one or two throttles actually transmit changes at the same time, your wireless performance will be as if there were only 1 or 2 throttles sharing the frequency. There might be a few more missed function key presses but speed and direction changes will seem almost instant.

Please try any or all of these operating modes. You can not damage or hurt any of the EasyDCC components so feel free to experiment because only you and your layout operators can decide what works best for your mix of mainline and switching operations.

Using The Performance Chart

Use the chart to select an operation mode. Then set up your receiver(s) and wireless throttles and try them out. If you discover the wireless response time is better than the graph shows, then you have selected an option that will work for you. But if you don't like the response time or you experience an uncomfortable number of missed key presses, try another option that offers better response time. More detailed response graphs that compare various options as each is loaded with more active wireless throttles are in the technical section of the EasyDCC System Installation and Operation manual. Remember that the graphs portray the worst case condition and your experience is likely to be better.

Wireless Setup Examples

Not all modes shown in the graph will be discussed since many differ simply in the number of throttles used but otherwise are setup the same. The examples shown offer a wide range of response times. However, always remember that the response time shown is based on the number of simultaneously changing throttles. If there is little throttle activity, the response time will be much shorter.

Scan-1: This is the best of all situations but also more expensive since each wireless throttle requires a matching receiver. If there are 5 wireless throttles in use, there will be 5 wireless receivers in use. Each receiver handles a single throttle and the matched throttle transmits continuously. This arrangement provides the best response time and comes closest to matching the plug-in throttle response. The maximum number of wireless throttle and receiver pairs is 8. Each throttle has its own dedicated frequency. There is no sharing of frequencies in this mode.

Scan-1

Response	Excellent
Ratio of Receivers to Throttles	1 to 1
Shared Frequencies	No
Max number of Wireless Throttles	8

Scan-2, Scan-4, Scan 6: This setting allows faster response time from a single wireless receiver because the wireless receiver is set to respond to a subset of the 8 frequencies. If you only have a few wireless throttles, this will speed up the response time since unused frequencies are skipped. Depending on the receiver's setting, the maximum number of wireless throttles that can be serviced by a single wireless receiver is 2, 4 or 6 with scan-8 described below. Each throttle has its own dedicated frequency. There is no sharing of frequencies in this mode.

Scan-8: This settings allows up to 8 throttles to be used simultaneously with a single wireless receiver. This is the default mode and allows up to 8 throttles to have their own dedicated frequency. There is no sharing of frequencies in this mode.

Scan-8

Response	Very Good
Ratio of Receivers to Throttles	1 to 8
Shared Frequencies	No
Max number of Wireless Throttles	8

Burst-2: Burst-2 mode allows up to 14 wireless throttles to be used simultaneously. This mode requires that the throttles share a frequency and take turns "bursting" out their command changes. However, this comes with a penalty in response time and a greater possibility of missed function key presses and speed command changes.

Burst-2 is the best compromise between response time and maximum number of throttles. This allows you to increase the number of throttles from 8 to 14 while experiencing response times similar to SCAN-8. The downside is that more wireless receivers are needed.

Burst-2

Response	Very Good
Ratio of Receivers to Throttles	1 to 2
Shared Frequencies	Yes
Max number of Wireless Throttles	14

Burst-3: With this mode, the two more throttles are allowed to join 2 of the 7 receivers. Although the number of receivers stays the same, this mode does put 3 wireless throttles sharing one frequency. This does exact a small response time penalty for the receiver servicing 3 throttles so this mode doesn't get the same rating as the burst-2 mode. But this mode does allow 16 wireless throttles to be used yet provide good, to very good response time.

Burst-3

Response	Good
Ratio of Receivers to Throttles	1 to 3
Shared Frequencies	Yes
Max number of Wireless Throttles	16

"Burst-4 through Burst-8:" In theory, 8 throttles can share a single wireless receiver frequency but you may find the response delay to be excessive and uncomfortable. For that reason, Burst-4 is rated only fair and Burst-5 and higher is labeled as having a poor response time. For a large layout with many active locomotives, this mode will probably be uncomfortable for your operators especially if sound decoders are used.

But, remember that the poor rating is for a test condition in which all throttles simultaneously send command changes. For actual operating conditions, where fewer throttles send out commands at the same time, the actual performance may be up to twice as good as the chart shows.

Burst-4

Response	Fair
Ratio of Receivers to Throttles	1 to 4
Shared Frequencies	Yes
Max number of Wireless Throttles	16

Burst-8

Response	Poor
Ratio of Receivers to Throttles	1 to 8
Shared Frequencies	Yes
Max number of Wireless Throttles	16

How To Choose?

Only you can decide which of these settings is good enough for your layout. If you decide that your first choice is good enough, then you are done and there is no need for a change. However, if you decide that the performance isn't up to your layout needs, then you can move to one of the other "upscale" modes knowing that your throttle response time and system performance will improve. Be sure to evaluate the various options with only advanced consists or single locomotives active. See page 1 for more information on maximizing system performance.

Throttle ID Requirements

To improve overall system response, wireless throttles are restricted to a select group of throttle IDs. This also allows the Command Station to know that a wireless throttle issued the command. You must select and use the appropriate number for proper operation of the wireless throttles and receivers. The ID numbers are split into two groups of 8 numbers.

Group 1 ID Numbers: 1, 2, 3, 4, 5, 6, 7, 8 are matched to Wireless Receiver RX904G1;

Group 2 ID Numbers: 9, 10, 11, 12, 13, 14, 15, 16 are matched to Wireless Receiver RX904G2.

Group 1 throttles can not be received by the Group 2 receiver and Group 2 throttles can not be received by the Group 1 receiver.

The only time Group numbers and their appropriate receiver becomes an issue is when more than 8 throttles are in use. By definition, 9 or more throttles will automatically require the use of both groups.

Pictorial Switch Settings For Wireless Operation Modes

Record Keeping Suggestions

Use the following charts to set up your wireless throttles. You may not need all of the spaces but you should keep the filled out chart handy. A year from now, if you need to make a change or determine a setting, it will be much easier to refer back to this chart.

San-1 through Scan-8

The first chart is if you are using 8 wireless throttles or less and assumes you will be using one of the scan modes. All of the throttle IDs are in group 1 so make sure your wireless receiver is a group 1 receiver. Note the serial number of your throttle in the space provided. Then set the frequency and the ID number. Note that only Group-1 IDs are used. Be sure the wireless receiver is using Group-1 software.

No More Than 8 Wireless Throttles - Scan Mode									
Group	ID #	Serial #	Mode	Suggested Frequency	Throttle Frequency Switch Setting	Receiver Setting Scan-2	Receiver Setting Scan-4	Receiver Setting Scan-6	Receiver Setting Scan-8
I	1		Scan	0					
	2		Scan	1		Scans F0, F1 only			
	3		Scan	2					
	4		Scan	3			Scans F0, F1, F2, and F3 only		
	5		Scan	4					
	6		Scan	5				Scans F0, F1, F2, and F3, F4, F5 only	
	7		Scan	6					
	8		Scan	7					Scans F0 through F8 or All Frequencies

CAUTION

Special Setup Required

Mixing Old TX904 With New RF1300 and T9000E Wireless Throttles

Due to the limitations and obsolescence of the components used in the old 5-function TX904 wireless throttle, a special wireless receiver is required.

Burst-2

This chart is for for use with the Burst-2 mode with two throttles per wireless recevier. Burst-2 is the best compromise between response time and maximum number of throttles. This allows you to increase the number of throttles from 8 to 14 while experiencing response times similar to SCAN-8. The downside is that more wireless receivers are needed. Note that both ID groups will be used and that each of the 7 receivers is set for a specific frequency. Note the serial number of your throttle in the space provided. Then set the frequency and the ID number.

Burst-2 Mode with 7 receivers						
Group	ID #	Serial #	Mode	Frequency	Throttle Frequency Switch Setting	Receiver Setup Switch Settings
I	1		Burst	0		
	2		Burst			Receiver #1 G1, F0, Burst
	3		Burst	1		
	4		Burst			Receiver #2 G1, F1, Burst
	5		Burst	2		
	6		Burst			Receiver #3 G1, F2, Burst
	7		Burst	3		
	8		Burst			Receiver #4 G1, F3, Burst
II	9		Burst	4		
	10		Burst			Receiver #5 G2, F4, Burst
	11		Burst	5		
	12		Burst			Receiver #6 G2, F5, Burst
	13		Burst	6		
	14		Burst			Receiver #7 G2, F6, Burst
Frequency 7 can not be used in the burst mode.						

Burst-3

This chart is for for use with the Burst-3 mode which allows the maximum of 16 wireless throttles to be used. In this mode, two of the frequencies will have 3 throttles each, with the remaining frequencies having only two throttles. It doesn't matter which two frequencies will have the extra throttles. This chart shows them in frequency 0 and 1 but they could have been placed anywhere. This mode requires 7 wireless receivers. In the space provided, note the serial number of your throttle in the space provided. Then set the frequency and the ID number and then setup the wireless receiver switches.

Burst-3 Mode with 7 receivers						
Group	ID #	Serial #	Mode	Frequency	Throttle Frequency Switch Setting	Receiver Setup Switch Settings
I	1		Burst	0		 Receiver #1 G1, F0, Burst
	2		Burst			
	15		Burst			
	3		Burst	1		 Receiver #2 G1, F1, Burst
	4		Burst			
	16		Burst			
	5		Burst	2		 Receiver #3 G1, F2, Burst
	6		Burst			
	7		Burst	3		 Receiver #4 G1, F3, Burst
	8		Burst			
II	9		Burst	4		 Receiver #5 G2, F4, Burst
	10		Burst			
	11		Burst	5		 Receiver #6 G2, F5, Burst
	12		Burst			
	13		Burst	6		 Receiver #7 G2, F6, Burst
	14		Burst			
Frequency 7 can not be used in the burst mode.						

Burst-4

This chart is for for use with the Burst-4 mode which allows all possible 16 wireless throttles to be used but only needs 4 receivers. In this mode, each frequencies will be shared by 4 wireless throttle. The benefit of Burst-4 is that only 4 receivers are needed and fair to good response can still be obtained. In the space provided, note the serial number of your throttle in the space provided. Then set the frequency and the ID number and then setup the wireless receiver switches.

Burst-4 Mode with 4 receivers						
Group	ID #	Serial #	Mode	Frequency	Throttle Frequency Switch Setting	Receiver Setup Switch Settings
I	1		Burst	0		 Receiver #1 G1, F0, Burst
	2		Burst			
	3		Burst			
	4		Burst			
	5		Burst	1		 Receiver #2 G1, F1, Burst
	6		Burst			
	7		Burst			
	8		Burst			
II	9		Burst	2		 Receiver #3 G2, F2, Burst
	10		Burst			
	11		Burst			
	12		Burst			
	13		Burst	3		 Receiver #4 G2, F3, Burst
	14		Burst			
	15		Burst			
	16		Burst			
Frequency 7 can not be used in the burst mode.						

Wireless System Performance Optimization

Wireless Receiver For Older TX904 Wireless Throttles

Although the TX904 Wireless Throttle uses a software chip that comes from a manufacturer that is no longer in business and for which there is no replacement, we have created special receiver software to allow this throttle to be used with the new EasyDCC Command Station software. Although it would have been much easier to simply obsolete this throttle, we understand the significance of your investment in this equipment.

The EasyDCC modular design allowed us to provide a bridge between the old and new system by way of the wireless receiver. So even though this throttle design is almost 10 years old (an eternity in the modern electronics age), we have allowed it to be used. It still has only 5 functions but at least you are not required to purchase all new throttles. And yes, the old and new throttles can be mixed although there are some limitations and restrictions

Note: the phrase old throttle refers only to the TX904 wireless throttle. A new throttle can be either a RF1300 or a T9000E wireless throttles.

The settings and options for the wireless receiver with software to use the older TX904 five-function throttles are the same. However, this receiver will not operate with the newer RF1300 or T9000E wireless throttles.

- Only 5 functions can be accessed from the TX904.
- Address selection remains the same – there is no difference.
- Only TX904 wireless throttles will work with the wireless receiver having the special TX904 software.
- An RF1300 or a T9000E will not work with this recever.
- Old style throttles can not share a burst frequency with new style throttles.
- A TX904 wireless throttle will not work with a wireless receiver that has software for the newer throttles.
- Special setup is required to use a mix of old and new wireless throttles.
- Old throttles automatically will use Group 1 IDs and new throttles must use Group 2 IDs.

Mixing Old and New Wireless Throttles

To mix old and new wireless throttles, the number and type of throttles becomes important and dictates how to hookup and setup the wireless receivers. It also restricts which of the performance options may be used. The restrictions are caused by the fact that the old and new throttles can not share a frequency and consequently can not share a receiver. In all cases, the wireless receivers are hooked up via the Extender and may share an extender, and the throttle bus. Separate buses are not required.

If you have from 2 to 6 old throttles, the new throttles are restricted to using only the Burst mode of operation and the listed frequencies. Note that Group-2 IDs are used so make sure the Receiver is also a Group-2 receiver.

Setting For TX904 Receiver. Group 1 ID	**Setting For RF1300/T9000E Receiver using Group-2 IDs**
Scan 2, using F0, F1	Burst, using only F2, F3, F4, F5 and F6
Scan 4, using F0, F1, F2, F3	Burst using only F4, F5 and F6
Scan 6, using F0, F1, F2, F3, F4 and F5	Burst using only F6

If you have more new throttles than old ones, the chart is a bit different but the concept is the same. Note that Group-2 IDs are used so make sure the Receiver is also a Group-2 receiver.

Setting For RF1300/T9000E Receiver. Group-2 IDs	**Setting For TX904 Receiver using Group-1 IDs**
Scan 2, using F0, F1	Burst, using only F2, F3, F4, F5 and F6
Scan 4, using F0, F1, F2, F3	Burst using only F4, F5 and F6
Scan 6, using F0, F1, F2, F3, F4 and F5	Burst using only F6

Burst 2 may also be used and this provides up to 8 old throttles to be used with 8 new throttles. The only restriction is that the TX904 throttles must be kept on the low ID numbers and that their burst performance will not be as good as the burst performance of the newer throttles.

Using Additional Receivers To Extend Reception Range

While using wireless throttles, you may encounter distant areas in which you experience intermittent or no throttle response. While the causes are varied, the solution is relatively simple; install another receiver to provide coverage in the distant area.

Receiver Setup

There is no difference in the receiver's setup switches. They will match the settings on the original receiver. If the new receiver is at the end of the throttle bus, the rules for using the termination are the same. Only one terminating resistor is to be used per extender.

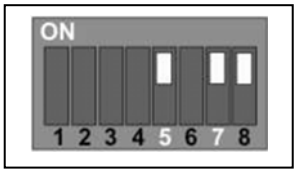
It is OK for the original receiver to be connected via the modular jack and the second distant receiver to use the throttle bus.

One for One Match

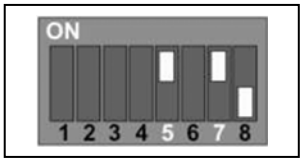
The distant receiver must be the same setup as the original receiver. For example, if your setup has two receivers, you will need two distant receivers also. The obvious option is for a throttle that never leaves an area. If this is so, there is no need to install a distant receiver for it.

Very large layouts or layouts in widely spaced rooms may need to use another wireless Basestation in a remote area to provide adequate reception. The only consideration is the distance from the extender to the remote wireless Basestation. If the distance is more than 100 feet, you must use RG6 coaxial cable. Smaller cable will have too much voltage loss. Make sure only one termination resistor is turned on and that it is at the end of the coax cable run. Do not use splitters or "Y's"other devices between the receivers and the extender.

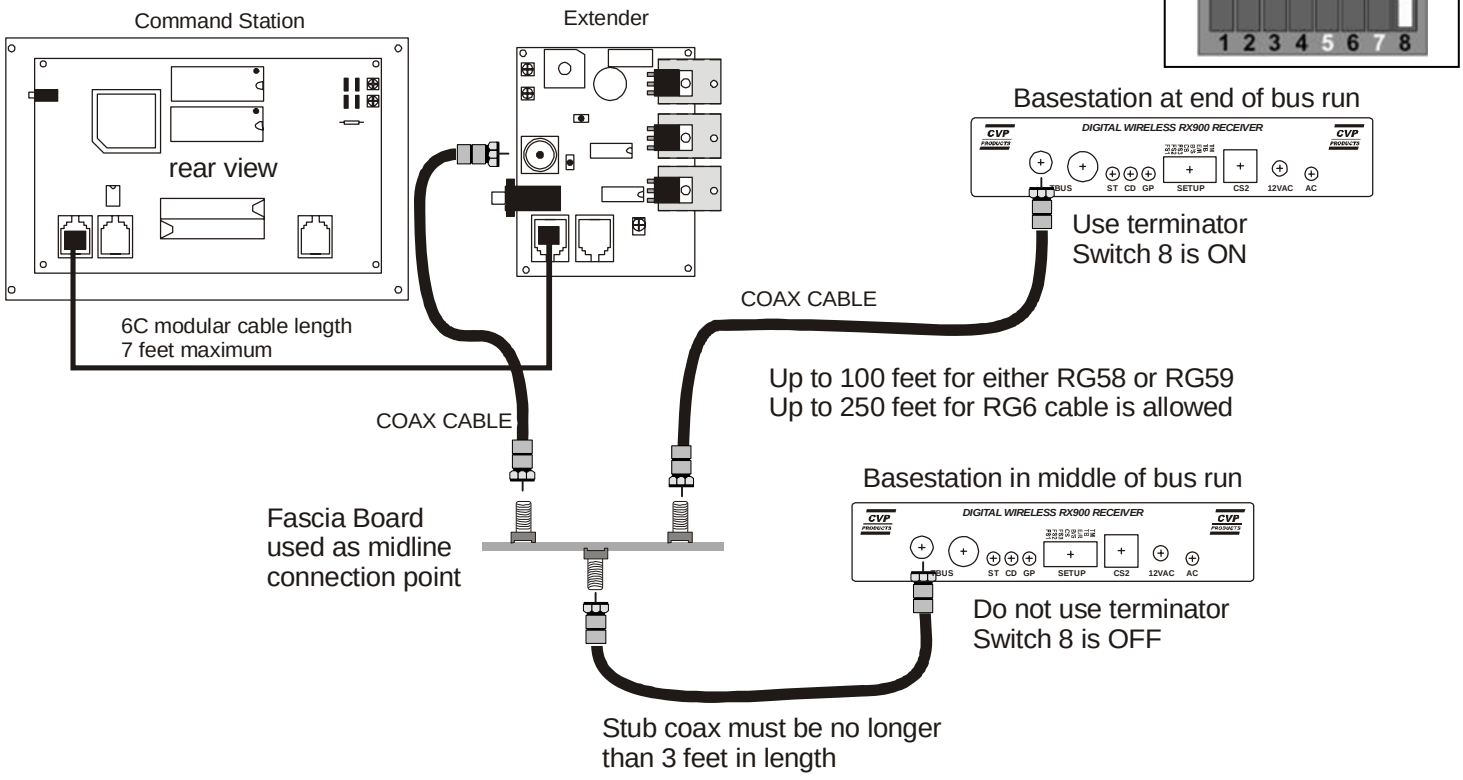
Switch 8 Setting Options – Depending on Location of Receiver



Basestation at End of Throttle Bus: If another Basestation is connected at the far end of the throttle bus coaxial line, the termination switch must be turned on. Turn switch 8 ON (up) to use the Basestation's built in termination. Only one terminator can be used.

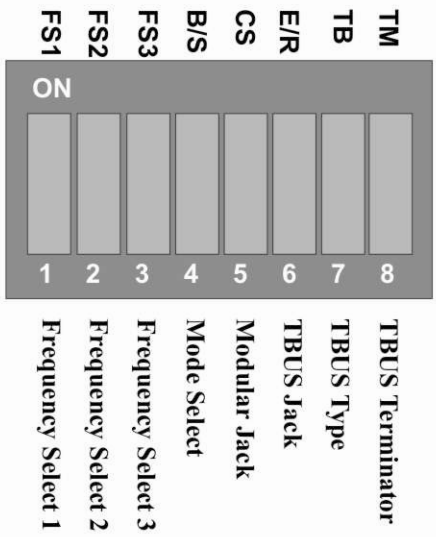


Basestation Used In Middle of Throttle Bus: A Basestation, or Basestations, that are connected somewhere other than at the end of the throttle bus, **must not** use the terminator. Make sure switch 8 is off. The stub coax needs to be 3 feet or less. An extra jack on a fascia board makes a good "T" but keep the cable short.

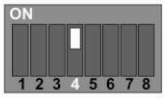


Revised Wireless Receiver Switch Settings and Explanations

Receiver Setup Switches



Switch Appearance



Switch ON or Up

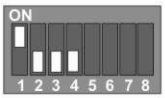
SCAN MODE

Switch OFF or Down

Scan Mode

Scan-1

One to one match between Throttle and Receiver. Select the received frequency using the chart to the right. All eight frequencies are available.



Scan-2

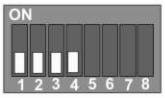
F0, F1 Scanned
F2, F3, F4, F5, F6, F7 ignored

Scan-4

F0, F1, F2, F3 Scanned
F4, F5, F6, F7 ignored

Scan-6

F0, F1, F2, F3, F4, F5 Scanned
F6, F7 ignored



Scan-8

All frequencies scanned
This is factory default setting

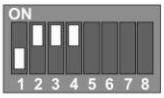
Ignored frequencies may be used by other throttles and receivers operating in burst mode. Do not use F7 if any throttles are set for burst.

Burst Mode

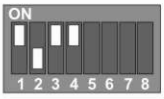
The received frequency is set using the first 3 switches. The 4th switch is placed up to set the receiver to Burst Mode.

F0

F1

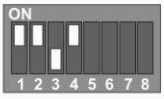


F2

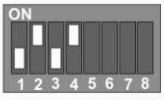


F3

F4



F5



F6

F7

Do not use F7 when any throttle is in Burst mode. This frequency is used for a "rest area" by all bursting throttles not sending data.

F7 is available **only** if all throttles are in Scan mode.

Enable TBUS Jack

EasyDCC TBUS in use and RX900E is plugged into the TBUS using the F-Jack or the 1/4" phone Jack.

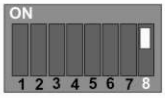
If TBUS jacks are not used, both switch 5 and 7 must be turned off to use the modular jack.

Enable Modular Jack

The modular jack allows quick connection between the receiver and the Command Station. The only requirement is that it be no further than 7 feet from the Command Station.

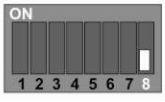
If more length is needed, you must use the TBUS jack and a Throttle Extender.

TBUS Terminator



75 ohm terminator ON

For use when receiver is at the end of coaxial line



Terminator OFF

Receiver LED Indicators

GP: Flashes and blinks when good throttle data is received. The flashes is not an indicator of bad reception. It varies between flashing and solid on.

CD: Error condition usually caused by an incorrect ID being received. Check the receiver's Group ID range (1-8 or 9-16) and make sure to set the throttle IDs to stay within this range.

ST: Blinks when the receiver is polled by the Command Station. It varies between flashing and solid on.

AC: Is on when the AC power adapter is connected.

What Equipment Requires New Software Chips?

CS2, CS2A and CS2B Command Station: This major system software upgrade will require the changing of the software chip inside your Command Station.

RX90xx Wireless Receiver Basestations: Both software chips inside the various types of receivers will be changed. Also, we have modified the Wireless Receiver software to allow multiple receivers to be used at the same time. The restrictions and limitations of primary and secondary receivers have been eliminated. All receivers are now the same, with one exception. This exception relates to the allowed IDs for the receiver and is not an issue except when you wish to use more than 8 throttles. For more details, see the section on upgrading the wireless receivers.

XR1300 Plug-in Throttle: The software chip inside your throttle will be changed for this upgrade.

RF1300 Wireless Throttle: The software chip inside your throttle will be changed for this upgrade

T9000E Wireless Throttle: This throttle will have to be returned to CVP Products for upgrading since it requires a new software to be programmed into the main processor. This software has not yet been completed and checked. We will send you a post card when we are ready to begin the conversion. Until then, do not use the T9000E with the newly upgraded system.

TX904 Wireless Throttle: Although this throttle uses a software chip that comes from a manufacturer that is no longer in business and for which there is no replacement, we have created special receiver software to allow this throttle to be used with the new EasyDCC Command Station software. Although it would have been much easier to simply obsolete this throttle, we understand the significance of your investment in this equipment. So the EasyDCC modular design allowed us to provide a bridge between the old and new system by way of the wireless receiver. So even though this throttle design is almost 10 years old (an eternity in the electronics age), we have allowed it to be used. It still has only 5 functions but at least you are not required to purchase all new throttles. And yes, the old and new throttles can be mixed although there are some limitations and restrictions

What Can'y Be Upgraded

Two digit systems can not be upgraded. However, you may purchase conversion chips to convert from 2 to 4 digit operation which will provide you with all the features of the upgraded system. However, older XR150 throttles can not be upgraded and can not be used with the new system upgrade. See below.

XR150 Plug-In Throttle: Unfortunately, the old XR150 throttles can not be upgraded and will not work with the new upgrade. This throttle uses a software chip from a manufacturer is no longer in business. What little inventory we have of this obsolete chip is reserved for repairs..

Tools Required

Small straight slot screwdriver

Small Philips screwdriver

Hand towel to protect surface

Magnifying glass for seeing chip orientation dimples and legends

Bright light

Warning: Command Station Memory Must Be Erased

Before using the new Command Station Software, you **must** clear everything from the Command Station's internal memory. Unfortunately, this will cause the erasure of all previously loaded data including, all standard consists, and all locomotive registration information. Before installing the new EPROM, yu may wish to record this information for later use once the new software has been installed.

Decoders Are Not Changed

Decoders are not modified in any way be the software upgrades or by erasing the Command Station's memory. However, if you have built advanced consists, you will have to re-enter them into the Command Station memory for proper operation. Decoders do not have to be powered up to re-enter advanced consists since they are already programmed.

Command Station Software Chip Change

Removing Old Chip

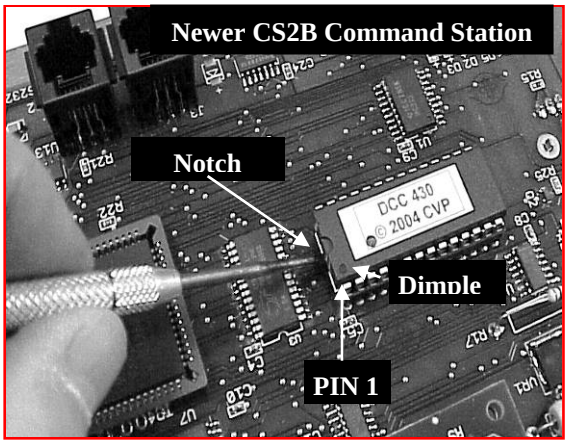
Unplug the AC adapter. For easier chip changing, place the Command Station on a flat surface with a hand towel underneath.

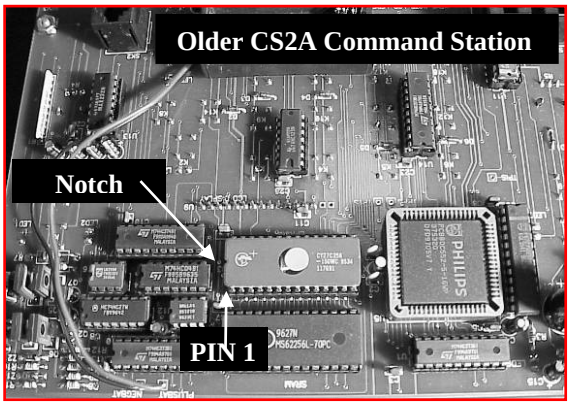
Locate the EPROM on your Command Station. This is the chip containing the system software. Although the chip's actual appearance and location will be different, depending on your Command Station model, the orientation requirements are the same.

Locate the polarization marks, which are usually notches or dimples on the chip. These are all used to mark the pin 1 location. The new chip MUST BE inserted with the same orientation.

Before handling any of the chips, touch your hand to a grounded metal object to discharge any accumulated static electricity.

Note that the chip is in a socket. If you accidentally remove the socket instead of the chip, you will destroy the circuit board. Be sure to identify the socket and the chip. Be sure to insert the tool between the socket and the chip. Use a small straight-slot screwdriver to help pry the chip from the socket as it is firmly held by the socket. Pry gently at each end of the chip. Take care not to damage adjacent chips or components.





Preparing New ERPOM

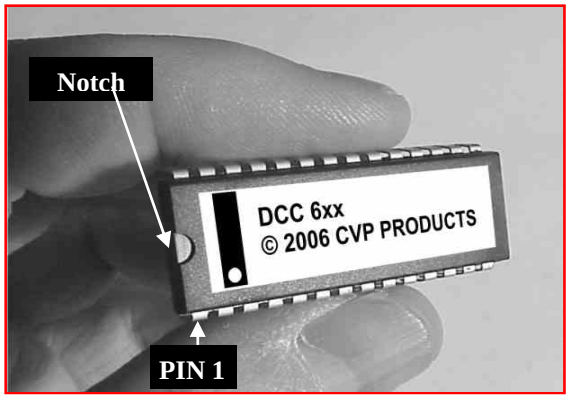
Remove the new EPROM from its protective tube. There is no need to return the old chip to CVP.

Carefully straighten any bent pins using needle-nose pliers.

Locate and identify the notch, dimple or dot on the chip. This is your reference point. Pin 1 is on the lower left end of the chip. Some chips may also include a dimple near pin 1. It is critical to identify the pin 1 for orientation. If in doubt, give us a call.

To ease insertion, you may gently bend the pins inward.

The label and notch will be oriented exactly the same way as the chip you just removed.



Installing New EPROM

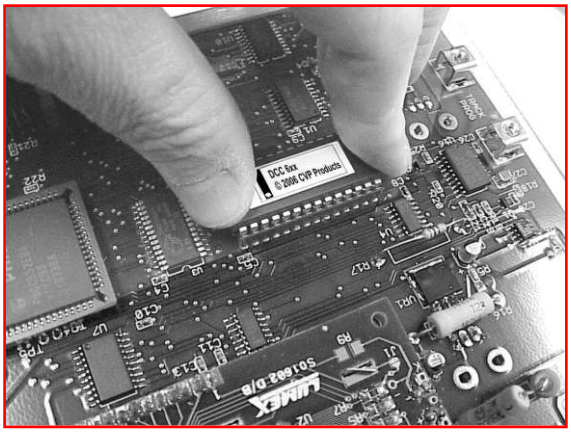
Check for proper orientation. Carefully insert the new chip into its socket. Apply equal pressure on both ends of the chip and gently push the chip into the socket.

Check that all pins go into the socket holes. Make sure none are bent up underneath the chip.

Check again that all pins are into the socket.

Checking EPROM Installation

Plug the AC adapter back into the Command Station and turn on the power. If you inserted the chip correctly, you will see the normal initialization messages. If no messages appear or garbage appears on the display, the most common cause of this is one or more EPROM pins not in the socket or incorrect orientation. Remove the chip, inspect for bent pins, orient properly, and reinsert.

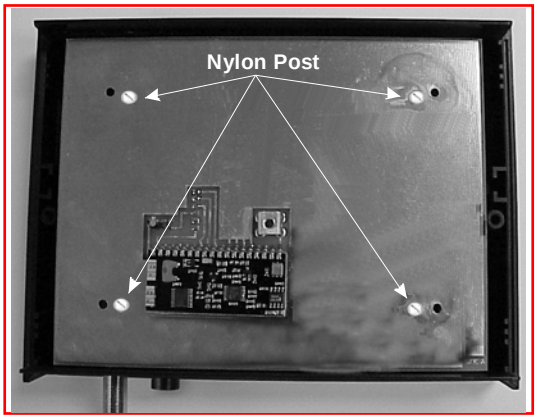


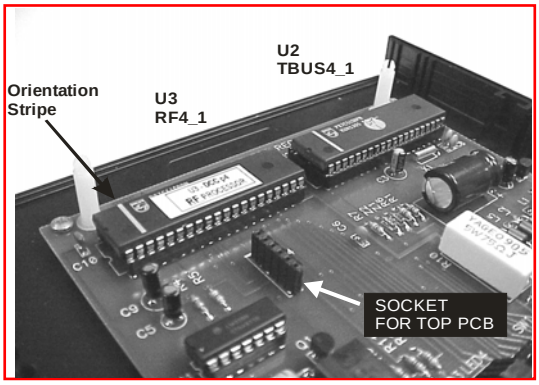
Mandatory: Clear Command Station Memory

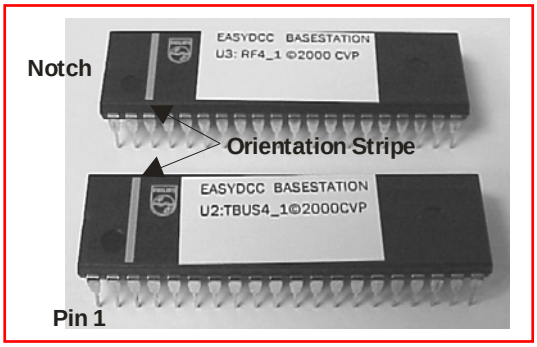
Before using, you **must** clear everything from the Command Station's internal memory. Push and hold the ENT key and then push and release the RESET key. Watch the display. When the message, MEMORY BAD appears, you may release the ENT key. If the message, MEMORY OK appears, repeat the procedure. The message MEMORY BAD must appear which indicates a clear memory.

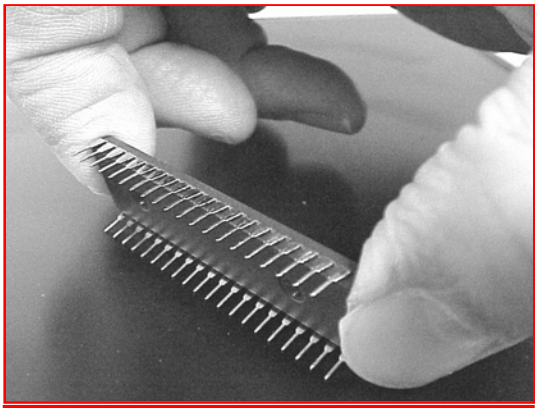
Wireless Receiver Chip Changes

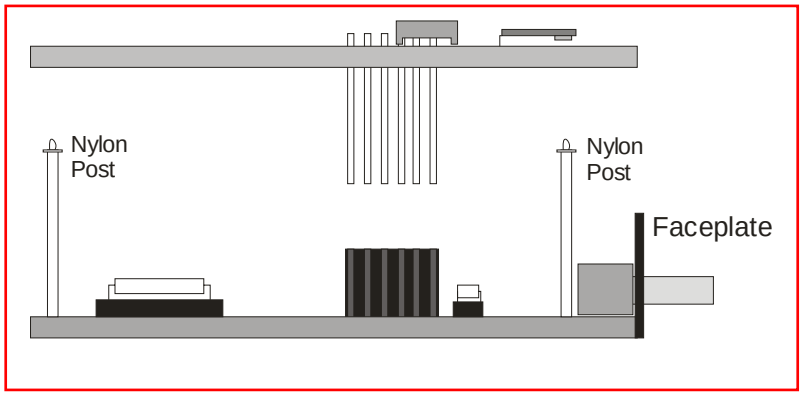
1. Unplug power cord.
2. Remove all cables.
3. Unscrew the antenna.
4. Turn receiver upside down and place on a flat surface.
5. Use a phillips screwdriver to remove the two screws holding the top and bottom together.
6. Carefully turn the receiver right side up and place on a flat surface.
7. Lift off the top and set aside.
8. Touch a metal surface before handling the circuit boards. There are two circuit boards stacked on top of each other. You must remove the top board to gain access to the chips. The top board is mounted to the bottom board using 4 snap-on nylon mounting posts and there is a pin-socket set that connects the top and bottom boards. It is important that the top board be lifted off so as not to bend the pins or socket. Gently pry the top board off the nylon posts one post at a time. Once free from the posts, gently pull the top board straight up to unplug the pins from the socket. Set it aside for now with the pins facing up.
9. Locate and identify the two large chips to be changed out. Also notice the orientation of the white stripe on the big chips. The board is silkscreened with the names and designators of these two chips which are not interchangeable.
10. Gently remove both chips using a small flat blade screwdriver inserted between the chip and the socket.
11. Touch a piece of metal before handling the chips. Locate the U3 chip (RF Processor) and remove it from its tube. To ease insertion, it helps to slightly bend the pins inward towards the center of the chip. Lay the chip on its side and gently roll it over so as to bend all pins an equal amount. Do this to the other side too. Orient the chip so the white stripe faces to the left with the label's printing right side up. Place the chip into the socket and press down equally along the length of the chip. Visually inspect each side to confirm that all pins are in the socket.
12. Repeat step 11 with the U2 chip (TBUS Processor).
13. Remounting the top board must be done properly or the pins will not go back into the socket properly. Place the receiver in front of you. Grasp the top board and orient it with the circuit module towards you. Visually line up the 4 nylon posts and gently lower the board squarely on to the posts. Just before the posts enter the top board's holes, you will feel the pins enter the socket. Stop and look between the two boards and confirm the pins are in the socket. Push the board down squarely until the posts snap into the holes. Inspect once more to confirm the pins are in the socket.
14. Plug in the power and turn on a throttle. The GP LED will turn on if the two boards are properly mated.
15. Reassemble the chassis top and reinstall the screws.







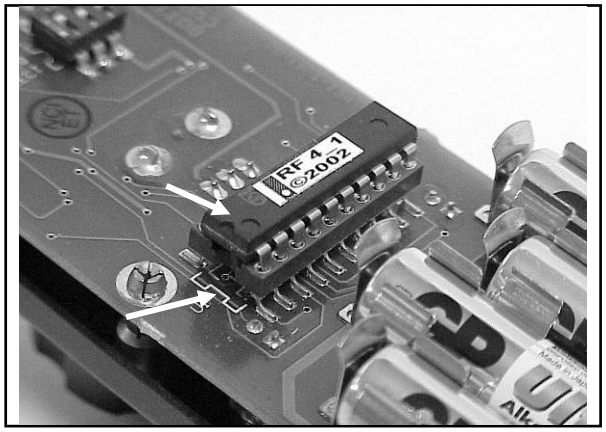




Discard The Old Chips

The old chips may be discarded. Do not return them to CVP Products. They can not be reprogrammed or erased.

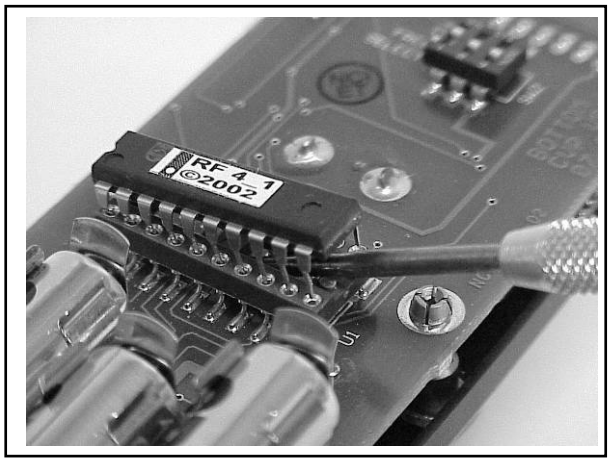
RF1300 Throttle Chip Replacement



Turn the throttle power switch to off. Remove the antenna and shipping screw if you still are using it. Open up the throttle. There is no need to remove the batteries. The large rectangular chip is in a socket. The chip will be removed from the socket. Don't make the mistake of prying the socket off the board. Doing so will destroy your throttle. Be careful!

Note the orientation of the chip. This orientation must be the same for the new chip. The upper white arrow points to the pin 1 identifier on the chip. The lower white arrow points to the silkscreen outline beneath the socket which also shows the orientation of the chip's notch. The notch on the chip faces the notch on the board's silkscreen.

Using a small screwdriver, gently pry the old chip out of its socket. It is best to lift each end a little at a time so as not to put any strain on the socket. Take care not to damage or touch adjacent components.



Before handling the new chip, touch your hand to a grounded metal object to discharge any accumulated static electricity. Remove the new chip from its shipping tube. It is OK to gently bend the pins inward for easier insertion into the socket.

Orient the chip correctly, check that all pins are started into the socket and then press it firmly until seated. Inspect for bent pins or pins not in the socket.

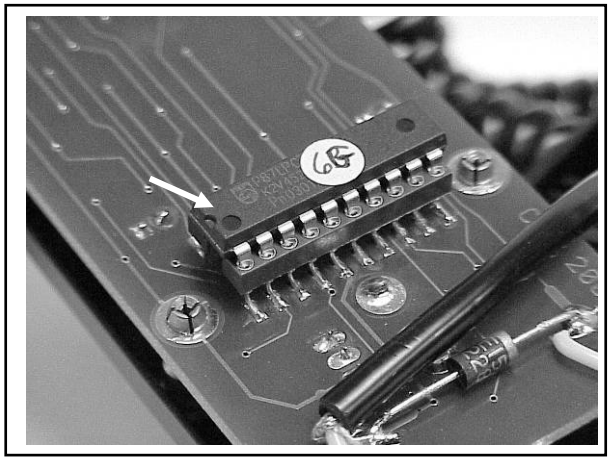
Turn the power switch on and check that the direction LEDs work normally.

Reassemble the throttle. The old chip may be discarded.

XR1300 Plug-In Throttle Chip Change

Be sure to unplug the throttle. Remove the 4 screws holding the cover to the plastic box. The layout is somewhat the same as the wireless throttle and the chip is located in about the same area.

The large rectangular chip is in a socket. The chip will be removed from the socket. Don't make the mistake of prying the socket off the board. Doing so will destroy your throttle. Be careful!



Note the orientation of the chip. This orientation must be the same for the new chip. The white arrow points to the pin 1 identifier on the chip.

Using a small screwdriver, gently pry the old chip out of its socket. It is best to lift each end a little at a time so as not to put any strain on the socket. Take care not to damage or touch adjacent components.

Before handling the new chip, touch your hand to a grounded metal object to discharge any accumulated static electricity. Remove the new chip from its shipping tube. It is OK to gently bend the pins inward for easier insertion into the socket.

Orient the chip correctly, check that all pins are started into the socket and then press it firmly until seated. Inspect for bent pins or pins not in the socket.

Plug in the throttle and check the direction LEDs for proper operation.

ID Numbers Must Be Changed For Both Wireless and Plug-in Throttles

Significant performance improvements for throttles have required a change in ID assignments and ID ranges for the two types of throttles. Incorrect throttle ID numbers will not operate properly and will be ignored.

Wireless throttles are restricted to IDs from 1 through 8 for Group I and 9 through 16 for Group II. A wireless throttle can not use an ID number above 16.

Plug-in throttles should use ID numbers from 17 through 31. However, a plug-in throttle can use any unused ID number from 1 through 31.