

## **CIVIR Information**

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### **Introduction**

Summary of changes are at the end of this document.

The CIVIR software is written to run on the CIVIR experimenter's board. The software provides the ability to send CI-V messages based on a received command from any infra red remote control capable of generating 36KHz Philips RC5 code. This is very common. When an IR command is received, the controller looks up the code in EEPROM and then builds and sends a CI-V message. Some commands are used to set up controller parameters such as frequency deltas. If desired, an IR command can be flagged to just send preset raw data. This can be useful to control RS232 devices. The EEPROM is downloaded/uploaded and edited through a windows interface program. Some controller values can also be modified by sending special IR sequences. The controller firmware (in flash) can be updated using the windows interface program, so new changes can simply be downloaded from the internet. An open collector output is also available to control an external signal line.

The system is very programmable. The configuration can be saved using the windows interface. This also allows one user to generate a configuration file for another user, or the users can share files.

### **Controller Firmware**

#### **Overview**

DO NOT ERASE the microcontroller. This will erase the boot loader code and the controller will not be able to be programmed.

The controller has 3 modes of operation: normal, edit EEPROM, and program flash.

In normal mode, the controller receives an IR command and sends a CI-V command. Some commands can be set to modify internal controller values such as frequency delta. A command can be set to just send a raw data stream. This is useful to control RS-232 devices.

In edit EEPROM mode, the controller is able to upload and download EEPROM contents to the windows interface program.

In program flash mode, the controller firmware can be changed by the windows interface program.

#### **Normal mode**

This mode is entered when the controller is powered up or reset with no jumpers on JP3. The LED will blink 2 times to indicate that the controller is running. A checksum is done on the EEPROM. If the EEPROM fails the checksum test, the LED will blink continuously. The EEPROM must be configured before normal mode can be used. If the EEPROM checksum is correct, the LED will remain off. When an RC5 IR command is detected, the LED will blink. If the detected command and system match a command in EEPROM, the appropriate action will occur. If this

results in a CI-V command, the command will be built and sent to the CI-V and RS232 connections. If the system has been set for a powerdown timeout, the system will go to powerdown mode when no IR commands have been detected for a preset interval. When data is detected on the IR interface, the controller will wake up. This is transparent to the user.

When a proper IR signal is detected, the controller decodes two IR values. One is the system ID. This value is usually associated with a particular device such as TV, VCR, Cable, etc. The second value is the command for that device. The CI-V controller allows two devices to be used. This allows the user to select TV or VCR (for example) to give more available codes. Each of the two system code values are configurable. If the system code matches one of the two programmed system codes, the controller examines the command code to see if an entry exists for that command. If there is no match, nothing is sent. If there is a match, the controller can either perform some internal function such as setting frequency deltas or send a CI-V message to a device.

If a CI-V message is to be sent, the controller builds a CI-V message from the configured data. For each command this includes the target radio's address, the CI-V command, any optional subcommand, and command data. The controller then checks the CI-V line and waits for any activity to end before sending the message. If a collision is detected while sending a message, the controller sends the CI-V jam code and retries.

If a raw message is to be sent, the controller simply sends the configured data bytes.

An IR command value can exist for either or both IR system ID's. When the command is created or edited, the user can specify whether the command is for just one of the system ID's or both system ID's. There is a default CI-V system address associated with each system ID. If the radio CI-V address is configured to F0, the default address for that system ID is used, not F0. This allows simply editing the default radio ID for a particular system ID to easily change the target address for a number of commands.

All actions are based on single buttons on the IR remote control. It is convenient to use the number keys for selecting up to 9 actions for each system ID (TV or VCR).

The 0 key is special. If a sequence starts with 0, the CI-V controller builds a number from the keyboard entry. The number is completed by sending the ENTER key. This value can be used for frequencies, frequency deltas, memories, levels, etc. The down arrow key (0x1d) is used to represent the MEGAHERTZ decimal point. So, 146.88MHz could be entered as 0146.88 ENTER. If the decimal is not entered, values will be just the last 5 or 2 values entered depending on what is being controlled. Referring to the previous example, 014688 (no decimal entry) would be invalid on most radios as it would represent 14.688KHz. 146880000 would represent 146.88MHz. The CLEAR (or left arrow) key (0x2c) clears the entry back to 0.

## **Edit EEPROM mode**

This mode is entered when the controller is powered up or reset with a jumper between pins 2 and 3 on JP3. The controller should NOT be connected to the CI-V bus in this mode. The controller should be connected to a PC to allow editing the EEPROM. The LED will blink 2 times to indicate edit EEPROM mode and will remain on. A serial ASCII stream is sent to ID the controller and versions. This mode also has additional features to help in using the remote control system. All communications in this mode are at 9600 baud.

The EEPROM contents can be uploaded and downloaded to the windows interface in this mode.

This mode can also be used to determine the RC5 system ID and command sent by a particular key on the infra red remote control. When a valid RC5 sequence is detected, the system and

command value are sent as 2 binary values over the RS232 interface. The values can be determined by viewing the monitor window in the controller interface. The monitor window must be set to 9600 to properly view these values. The RC5 data format has a system value and a command value. There is a toggle bit that changes each time the remote control key is pressed. The system byte is sent first. Only the lower 5 bits are of interest. These contain the system value (TV, VCR, etc.) Bit 5 of the system byte will toggle with each press of the IR controller keypad. The second byte is the command. Only the lower 6 bits are of interest. Example: You see "E0 02" when you press the 2 key on the IR remote controller. This indicates that the system is 0 and the command is 2.

The Edit EEPROM mode also provides a limited method of changing some EEPROM parameters. When in this mode if the sequence UP, LEFT, POWER is entered on a remote, the LED will blink a long then a short blink. The following sequence on the IR controller keypad allows modifying selected EEPROM values:

CLEAR (usually left arrow on the remote)  
 Parameter ID  
 ENTER  
 Parameter value  
 ENTER

Parameter ID	Parameter value	Description
34	0 – 239	Sets the controller ID in decimal.
45	0 – 4	Change controller CI-V baud 0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200
49	4 or 5	Selects the number of frequency data bytes for predefined functions.
56	0 – 239	Change the default radio address for TV device in decimal
67	0 – 239	Change the default radio address for VCR device in decimal
78	0 – 200	Change powerdown timeout 0 = no timeout

Note that most of the values are ones that are normally referenced as hex values. The equivalent decimal number must be entered in this mode. The Microsoft windows calculator accessory program which is included with all versions of windows can be used to make this conversion.

If the parameter number and value are accepted, the LED will flash 2 times. If an error is detected, the LED will flash 10 times rapidly.

The IR configuration mode can be exited by sending EXIT several times from the remote control.

## Program flash mode

This mode is entered when the controller is powered up or reset with a jumper between pins 1 and 2 on JP3. The controller should NOT be connected to the CI-V bus in this mode. The controller should be connected to a PC to allow downloading firmware. The LED will blink 4 times to indicate program flash mode and will remain on. In this mode, the windows interface program can reprogram the flash memory of the controller. There is no other function in this mode. All communications in this mode are at 9600. Each time the Windows interface program successfully

updates the flash, the LED will blink 2 times slowly. If the controller detects an error such as an incorrect checksum, the LED will blink 10 rapidly.

## Windows interface program

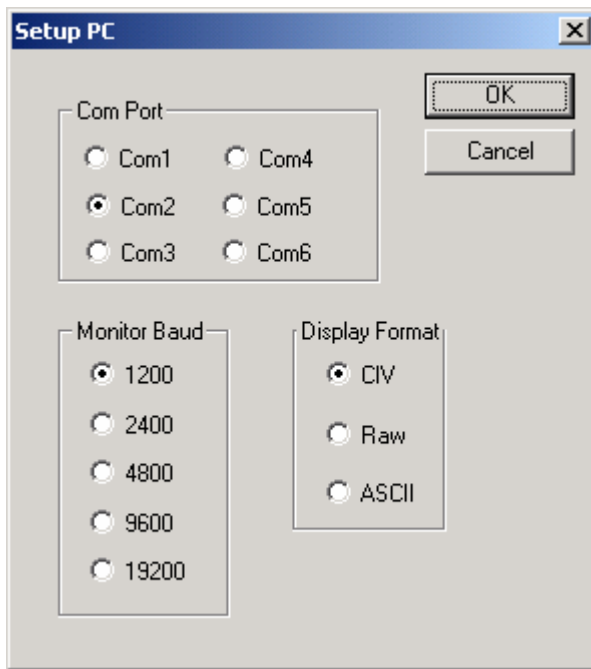
### Overview

The windows interface program provides 3 functions:

- Monitor window to display CI-V bus activity
- Create, edit, and upload/download the EEPROM configuration information
- Update the controller firmware

The windows program does not make any registry entries. There is no installation. The program is simply copied to a convenient folder. To remove the program, simply delete the program file and the CIVMon.cfg configuration file. The desired serial port, COM1 thru COM6 is selected through the Setup PC dialog box from the Tools menu.

### Setup PC



### Monitor window

The monitor window displays activity on the CI-V bus. The data is displayed in hex ASCII format. There are two modes of operation. In CIV mode, the monitor displays each CI-V message on a new line. In Raw mode, the data is simple displayed. The monitor window baud rate is controlled through the Setup PC dialog box accessed through the Tools menu. The baud rate should be set to the baud rate of the CI-V bus being monitored. The monitor window can be cleared by:  
Tools -> Clear monitor.

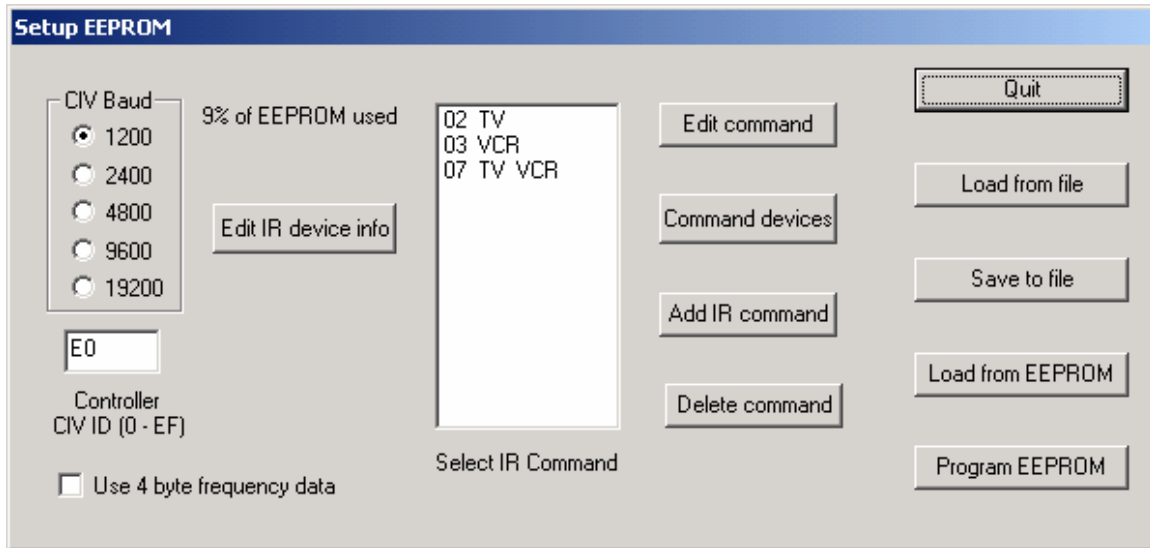
### Update controller firmware

This function is used to update the controller firmware. It is accessed through:  
Tools -> Program FLASH. The controller must be connected to the PC and must be in program flash mode ( program flash jumper installed before power up).

## Configure controller

All of the controller's configuration information is stored in its EEPROM. The windows interface program allows:

- Create, edit, delete an IR entry
- Change the controller CI-V address
- Change the controller CI-V baud rate



The CIV Baud radio buttons select the CI-V baud for all commands

The controller ID is used for all CI-V commands.

Checking the "Use 4 byte frequency data" box will limit frequency data to 4 bytes instead of the normal 5 for predefined functions. This is to accommodate the IC-735. The default is unchecked, giving 5 bytes.

Load from file is used to load a saved configuration into the program.

Save to file allows saving a configuration to a file.

Load from EEPROM loads the current EEPROM configuration from the controller.

Program EEPROM programs the EEPROM in the controller.

The Radio CIV address is used to set the target radio CI-V address for this command. There are 2 special cases. Address FE is used to indicate a special controller command such as setting a frequency delta to be used in commands. Address F0 instructs the controller to use the default address for the current IR system ID (VCR or TV). This allows changing the target address for a number of commands by simply changing the default address.

The CIV command is the desired CI-V command. The Lookup commands button can be used to find and enter a command.

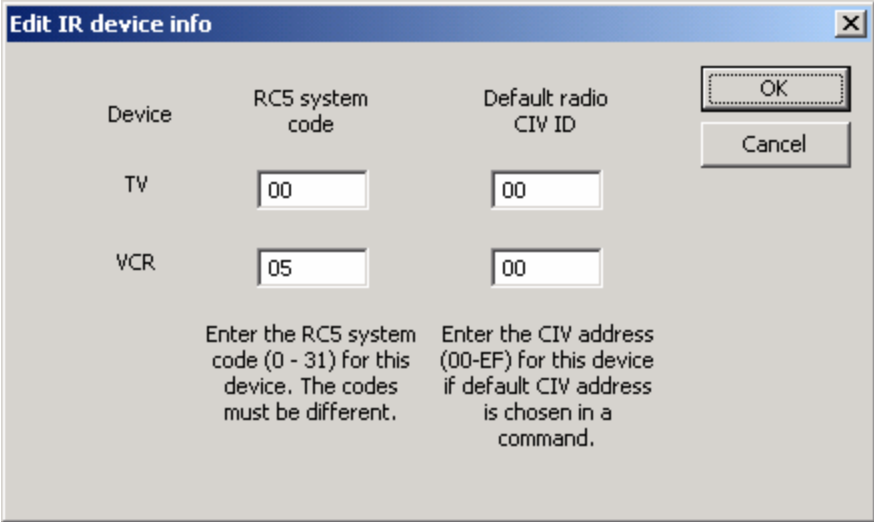
The CIV subcommand is used if the command requires a sub command. If no subcommand is required, it should be blank.

Switch to raw changes the mode to just allow a raw data stream to be sent without any CI-V consideration.

The CIV message listbox shows the information that will be sent to the target radio.

Add function button adds the selected macro to the CIV message. Note that some macros must be the only item. Macros that are controller commands require that the CIV address by FE.

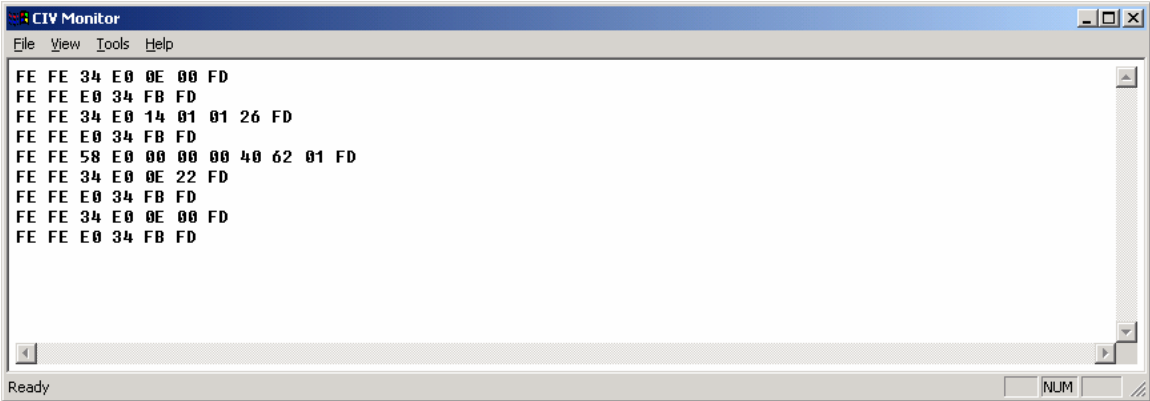
Insert hex adds the hex value to the end of the current message. The Add as 5 BCD button is mainly for conveniently entering a frequency. Enter a frequency in Hertz and click the Add as 5 BCD button. The value is added to the message in the correct sequence.



This dialog box is used to assign the IR system codes and the default radio address for each system code. The system codes sent by the IR remote control can be determined by viewing the monitor window when the controller is in EEPROM configuration mode.



This dialog box determines which device codes are active for the selected command.



The monitor window allows the user to easily check programming.

## Notes

- All programming communications is at 9600. This is selected automatically, regardless of the selected monitor window baud rate. The monitor window is mostly used to monitor the CIV bus to assist in building commands. To monitor the IR data sent in EEPROM program mode, the monitor window must be set to 9600 baud through the Setup PC dialog box.
- EEPROM configuration data can be saved to any file of your choice. That makes it easy to return to a previous configuration. Also, you can send others configurations that you develop.
- The flash data is encoded. Erasing the chip will erase the boot loader and the flash will no longer be able to be updated by the Windows interface program. You can still develop your own code for the system.
- You can leave out the processor and IR decoder to use the board as an RS-232 to CIV interface only.
- Please send any suggestions for improvements or comments to [info@pdsengr.com](mailto:info@pdsengr.com).

## Changes

Windows interface:

Version 1.5

- Added capability to accommodate the 4 byte frequency data requirement for the IC-735.
- Added support for Com3 – Com6.
- Added ASCII display format for monitor window.

AVR processor

Build 0x0106

- Added support for limiting frequency data bytes to 4.