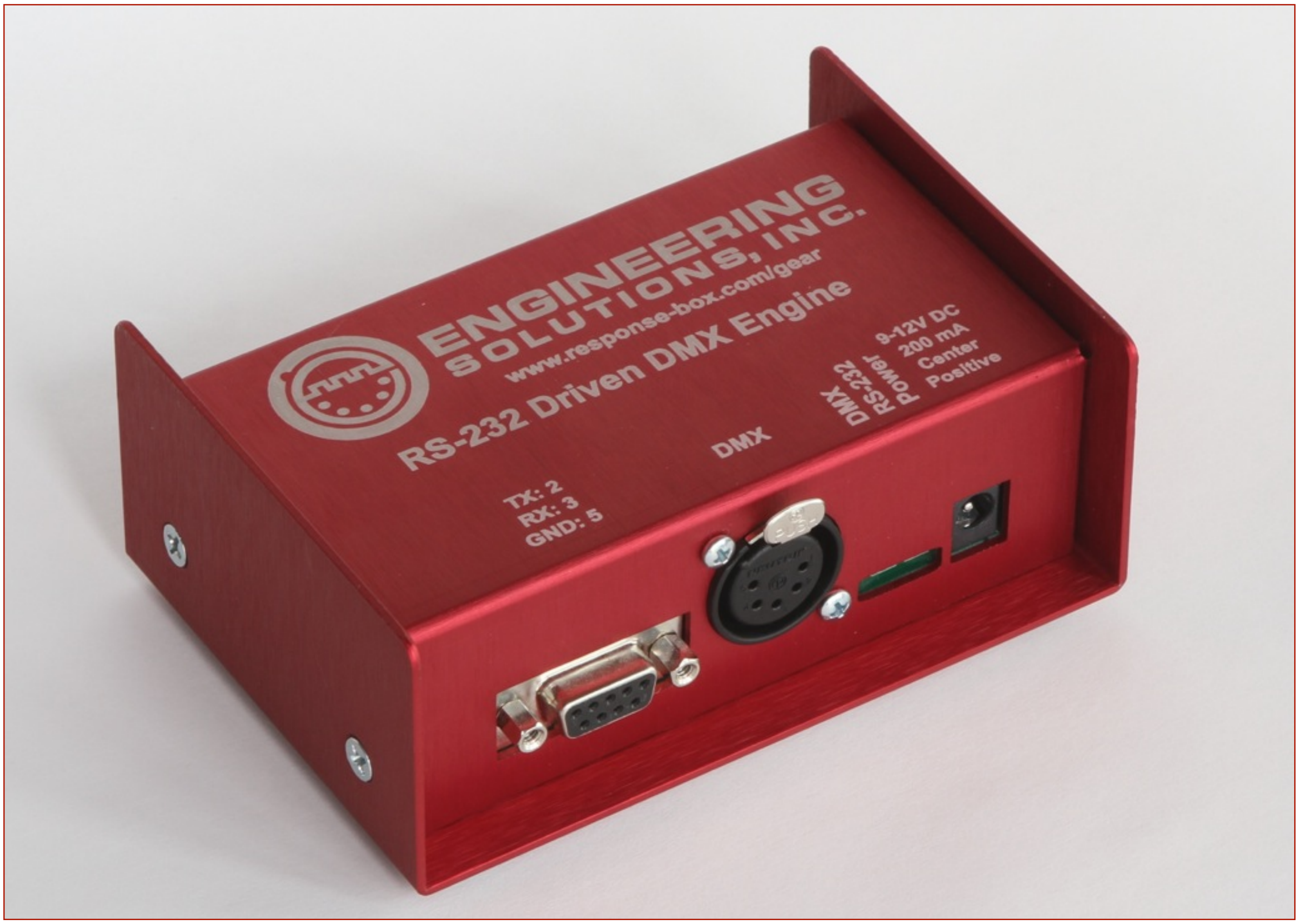
The RS-232 Driven DMX Engine

Simple Yet Powerful Lighting Control

Firmware 4.85, May 2014



Firmware Change Summary

4.85 (May 2014)

- Add simultaneous, multi-speed fading
- Add Halt command and feedback
- Add 'commend ignore'
- Add verbose debugging

4.07 (DECEMBER 2013)

- Baud rate checking, system forces to 9600 after reboot if a nonstandard baud rate is specified.
- Add command for software reboot
- Add command to pause mid-fade
- Add command for jogging individual DMX channels up and down
- Add command for 'scene masking' when pre-stored scenes are recalled
- Add command for verbose debug / serial feedback

4.05 (AUGUST 2012)

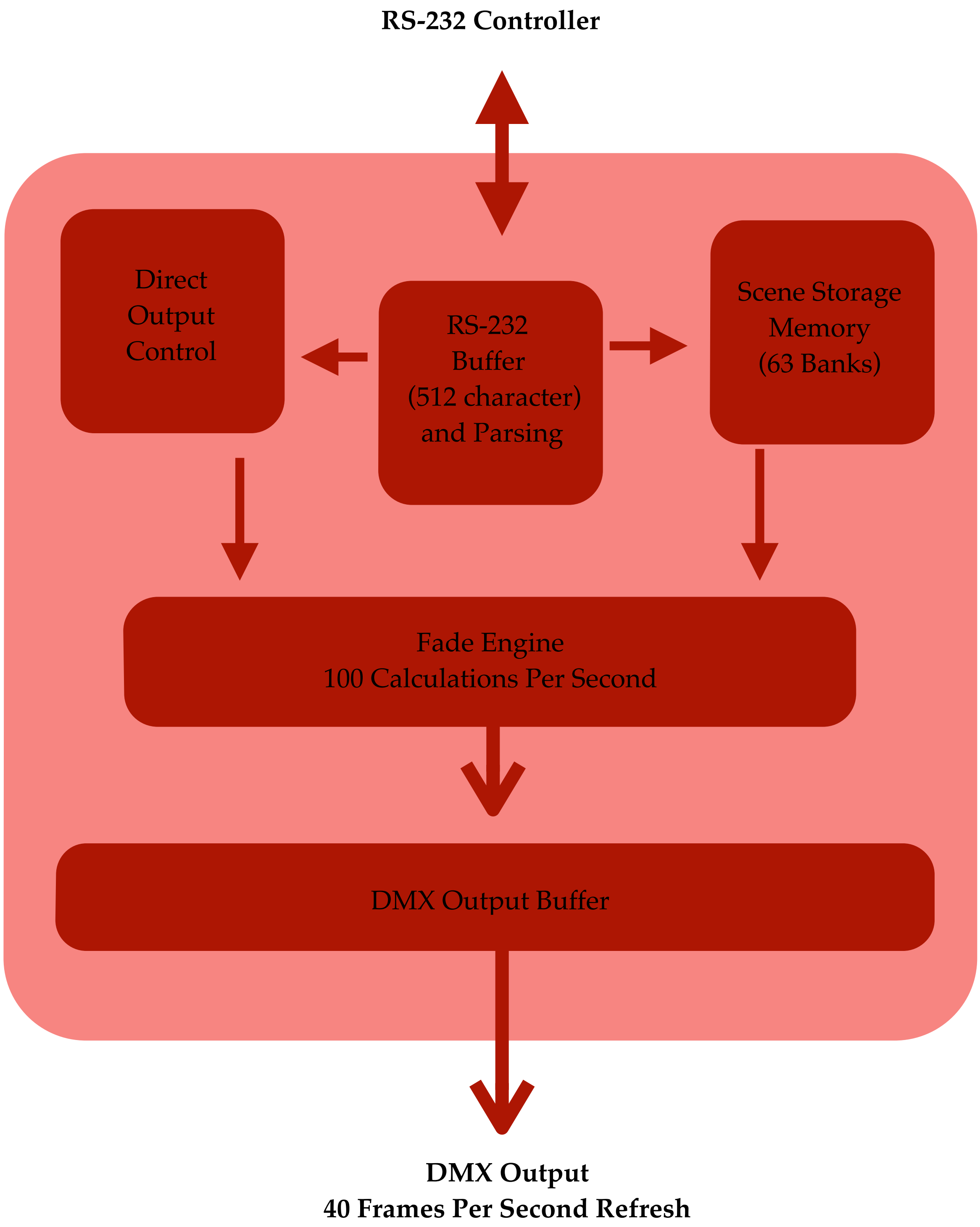
- Add scene storage
- Add scene recall
- Add baud rate selection
- Add channel query
- Add 'layer' *A* command for building a scene channel by channel using multiple commands

2.00

- Original release

System Overview

The RS-232 DMX Engine is a self-contained DMX controller. It accepts simple, human-readable commands via RS-232 and uses these commands to generate, recall and crossfade between DMX scenes.


RS-232 Controller
Direct Output Control
RS-232 Buffer (512 character) and Parsing
Scene Storage Memory (63 Banks)
Fade Engine
100 Calculations Per Second
DMX Output Buffer
DMX Output
40 Frames Per Second Refresh

System Overview

The DMX Engine accepts RS-232 commands at any standard baud rate. Incoming serial data is buffered in the system's memory until a carriage return is received, which signifies the end of a command.

Once the command has been received, it is parsed. Commands containing syntax errors are ignored, and an error message is transmitted back to the RS-232 host. Valid commands are processed immediately.

Commands can contain information directing the system to

- Set DMX channels to certain levels.
- Store scenes (a snapshot of the DMX output buffer) in memory.
- Recall scenes from memory using a very simple command syntax.
- Fade between different scenes. The system automatically calculates all intermediate DMX channel values, and requires only a crossfade time from the end user.
- Report the state of any DMX channel back to the user via RS-232.

More significantly, commands may be processed simultaneously, with the only limit being (a) the RS-232 port speed and (b) the 512-byte receive buffer. This means that, for example, a group of channels can fade between levels at one rate while a second group of channels can fade to different levels at a completely different rate.

Users of high-end theatrical lighting consoles may recognize this feature as 'simultaneous cue stacks,' and it adds a great deal of flexibility to the system's operation.

SYSTEM SPECIFICATIONS

Power Supply

9-15v DC, 200 mA, center positive. Barrel size is 2.1 x 5.5 mm. System ships with a switching power supply, 9V DC output, 300 mA, 80-240V AC input. It will work worldwide, though an adapter for the two-pin American-style plug may be required. Check a travel shop, or ask at a hotel's front desk if they have any in Lost & Found.

DMX Output

Standard XLR pinout per USITT

- Pin 1 ground
- Pin 2 Data -
- Pin 3 Data +
- Pins 4 & 5, if XLR5 jack is installed, are not connected

Serial Command Protocol

Baud Rate: 9600, 19,200, 38,400, 57,600 or 115,200, 8N1, user selectable. Default is 9600.

- Pin 2 is system transmit
- Pin 3 is system receive
- Pin 5 is ground

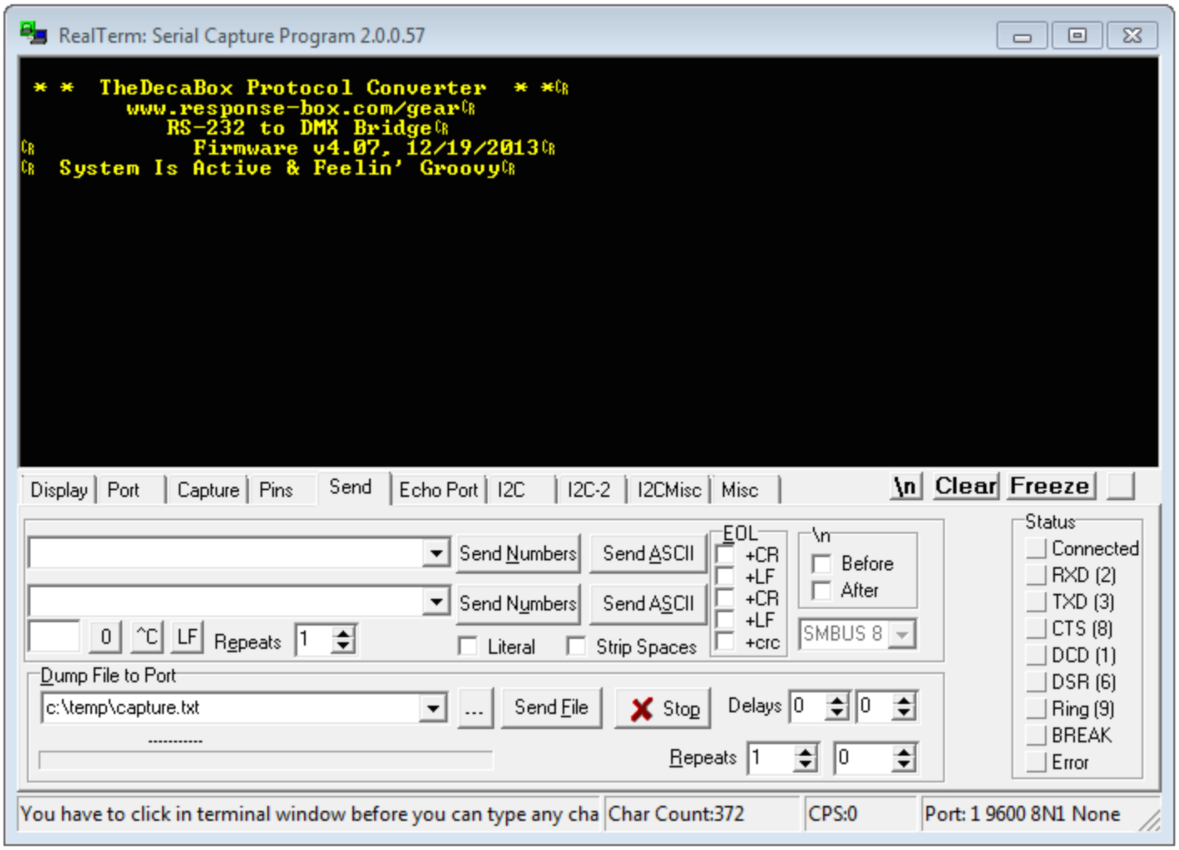
Pin 4 (DTR) is used to update the system's firmware. This allows new features to be added in the field, without requiring the hardware to be shipped back to our shop. If asserted (set high) by the PC or other controlling equipment, the system will wait in 'reset' mode for new firmware and the system will neither accept serial commands nor output DMX. In normal use, either physically disconnect this wire or ensure that DTR is cleared.

Depending on which external devices are being controlled, a crossover cable (which swaps pins 2 & 3) *may* be required. When connected directly to a PC, a 'straight' cable works properly.

In the following pages, the text [cr] is used to represent a single data byte, the carriage return. This value is decimal 13 or hex 0x0D.

Many screenshots show data sent / received through a terminal program, as well as a screenshot from a DMX monitoring program. Data sent from the PC to the system is displayed in green text, and data generated by the system is yellow. Thus, system output can be easily compared with RS-232 input.

Startup



RealTerm: Serial Capture Program 2.0.0.57

```
 * *  TheDecaBox Protocol Converter  * *CR
        www.response-box.com/gearCR
           RS-232 to DMX BridgeCR
CR            Firmware v4.07, 12/19/2013CR
CR  System Is Active & Feelin' GroovyCR
```

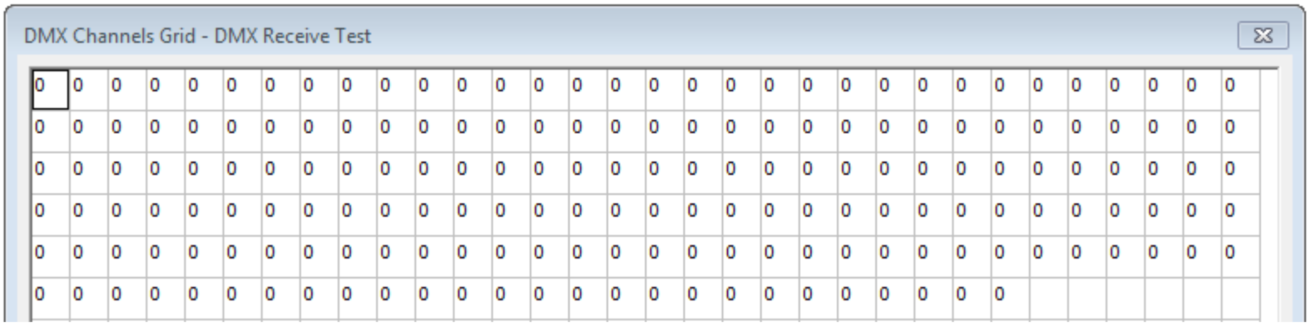
Repeats 1

Dump File to Port c:\temp\capture.txt

Delays 0 0

Repeats 1 0

You have to click in terminal window before you can type any cha | Char Count:372 | CPS:0 | Port: 1 9600 8N1 None



DMX Channels Grid - DMX Receive Test

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						

When the system boots for the first time, the power LED will illuminate. The DMX and RS232 LEDs will flash in unison several times. Finally, the DMX LED will illuminate at ~ 40% intensity. This signifies that the system is operating normally. The DMX LED actually toggles between on and off each time a byte of DMX is transmitted, so this 40% LED is actually a good indicator of the system's heartbeat.

If the LEDs don't flash at startup, the system is probably being held in reset mode. Check to see if RS232 pin #4 (DTR) is asserted, and see page 4 for a description of why this is important.

Also at startup, the system transmits a 'splash screen' through the RS232 port. This confirms proper system operation, and also displays the current firmware revision.

As shipped from the factory, the system defaults to 9600 baud, 8 bits, no parity, 1 stop bit. It's designed to connect directly to a PC or other source hardware. This means that a standard 'straight' serial cable will work properly for initial testing. Depending on the system pinouts of other control hardware being used (ie Crestron, Elan, etc) a crossover cable may also be required.

The following pages will discuss the process of building, storing and recalling a DMX scenes.

BUILDING A NEW SCENE

```
FXXX@YYY:TTT[cr]
FXXX@YYY,AAA@BBB,CCC@DDD:TTT[cr]
```

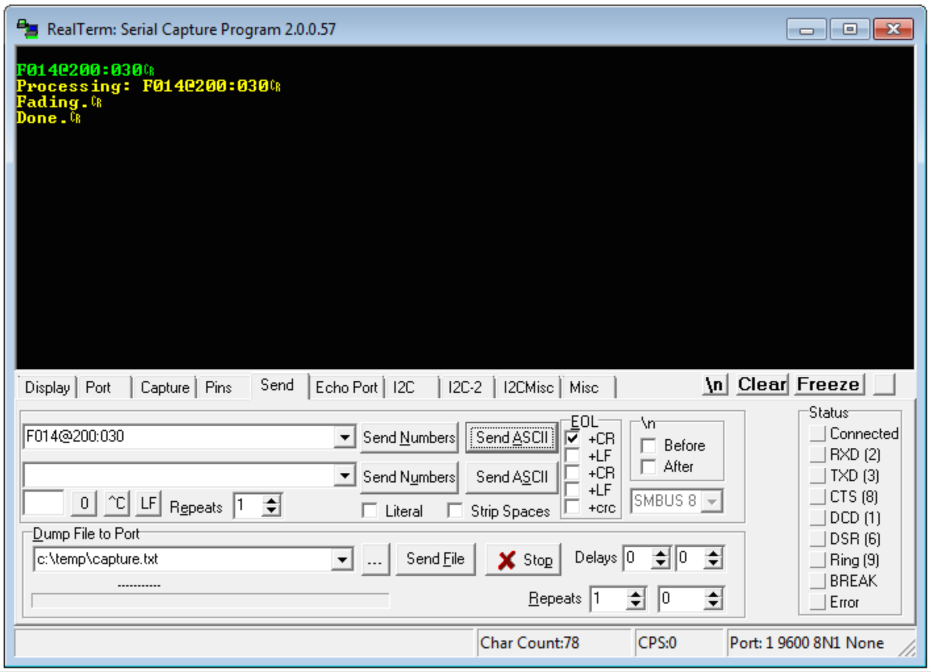
- F is a capital F
- @ is the ASCII 'at' character, hex 0x40
- XXX, AAA, CCC are three digit DMX channel numbers with range [001 512]. As only channels 1-512 exist in a typical DMX universe, channel 000 can used to select all channels.
- YYY, BBB, DDD are three digit channel values with range [000 255] (:) is the ASCII colon character, hex 0x3A
  TTT is a three digit time value, in tenths of a second, range [000 999]
- [cr] is the carriage return character, decimal 13 or hex 0x0D.

For 'F' commands, the channel:value information contained in each string *replaces* everything in the active DMX output buffer. This buffer is refreshed ~40 times per second, regardless of incoming serial data. If a channel is not specifically mentioned in an F command, it is set to zero when the command is executed.

For example, following the completion of these (one with a zero fade time, one with 2.4 seconds and one with 1.0 second crossfades):

```
F001@100:000[cr]
F010@128,011@127,012@126:024[cr]
F007@010:010[cr]
```

... the DMX output buffer would have the following values:
CH1 - CH6: 0
CH7: 010
CH8-CH512: 0



RealTerm: Serial Capture Program 2.0.0.57

```
F014@200:030␍
Processing: F014@200:030␍
Fading.␍
Done.␍
```

F014@200:030

Repeats 1

EOL ☑ +CR □ +LF □ +CR □ +LF □ +crc

\n □ Before □ After

□ Literal □ Strip Spaces

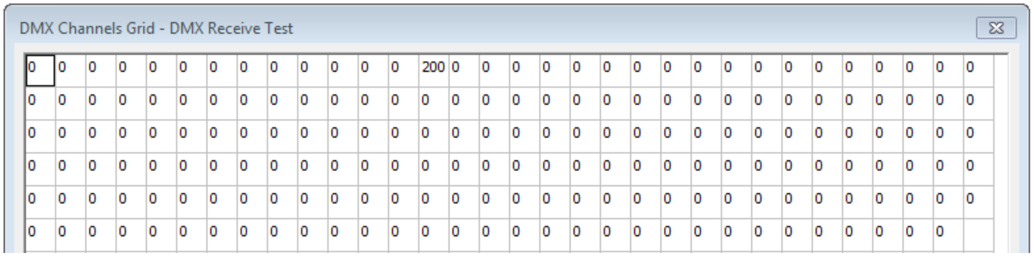
Dump File to Port: c:\temp\capture.txt

Delays 0 0

Repeats 1 0

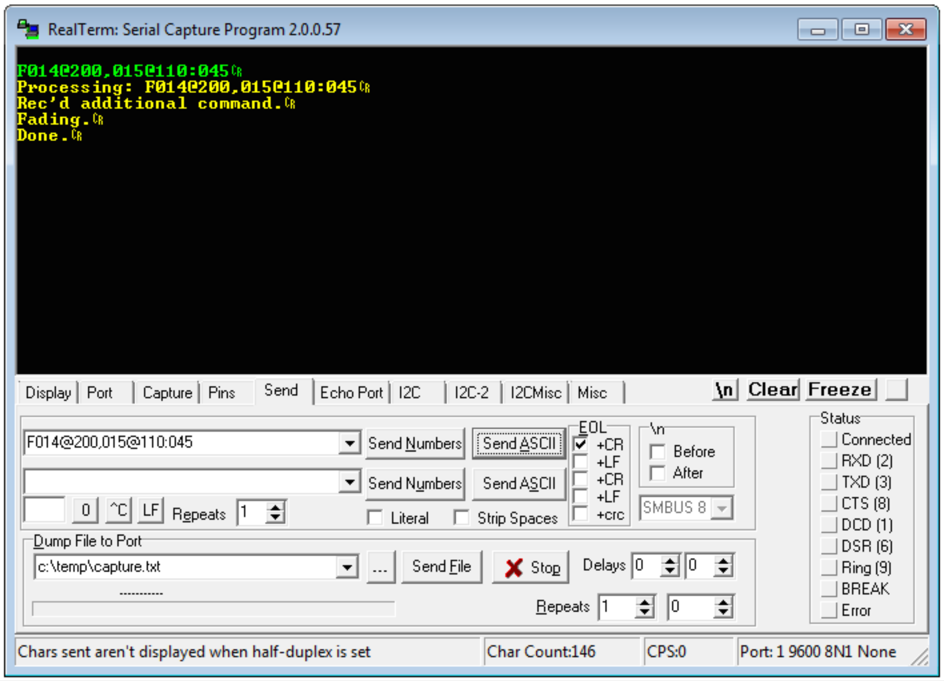
Status: □ Connected □ RXD (2) □ TXD (3) □ CTS (8) □ DCD (1) □ DSR (6) □ Ring (9) □ BREAK □ Error

Char Count:78 | CPS:0 | Port: 1 9600 8N1 None



DMX Channels Grid - DMX Receive Test

0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	



RealTerm: Serial Capture Program 2.0.0.57

```
F014@200,015@110:045␍
Processing: F014@200,015@110:045␍
Rec'd additional command.␍
Fading.␍
Done.␍
```

F014@200,015@110:045

Repeats 1

EOL ☑ +CR □ +LF □ +CR □ +LF □ +crc

\n □ Before □ After

□ Literal □ Strip Spaces

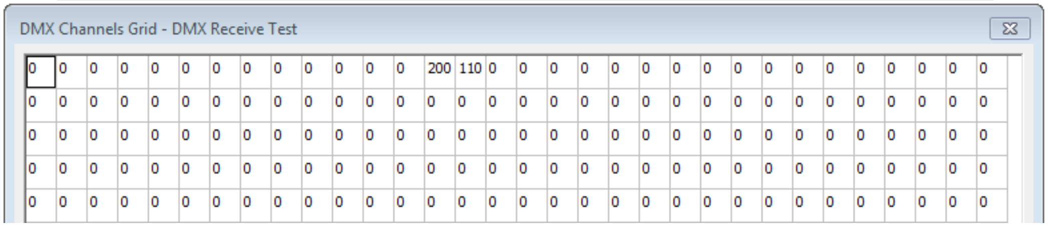
Dump File to Port: c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Status: □ Connected □ RXD (2) □ TXD (3) □ CTS (8) □ DCD (1) □ DSR (6) □ Ring (9) □ BREAK □ Error

Chars sent aren't displayed when half-duplex is set | Char Count:146 | CPS:0 | Port: 1 9600 8N1 None



DMX Channels Grid - DMX Receive Test

0	0	0	0	0	0	0	0	0	0	0	0	0	200	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ADDING TO A SCENE

```
AXXX@YYY:TTT[cr]
AXXX@YYY,AAA@BBB,CCC@DDD:TTT[cr]
```

- A is a capital A
- XXX, AAA, CCC are three digit DMX channel numbers with range [001 512]
- YYY, BBB, DDD are three digit channel values with range [000 255]
- TTT is a three digit time value, in tenths of a second, range [000 999]

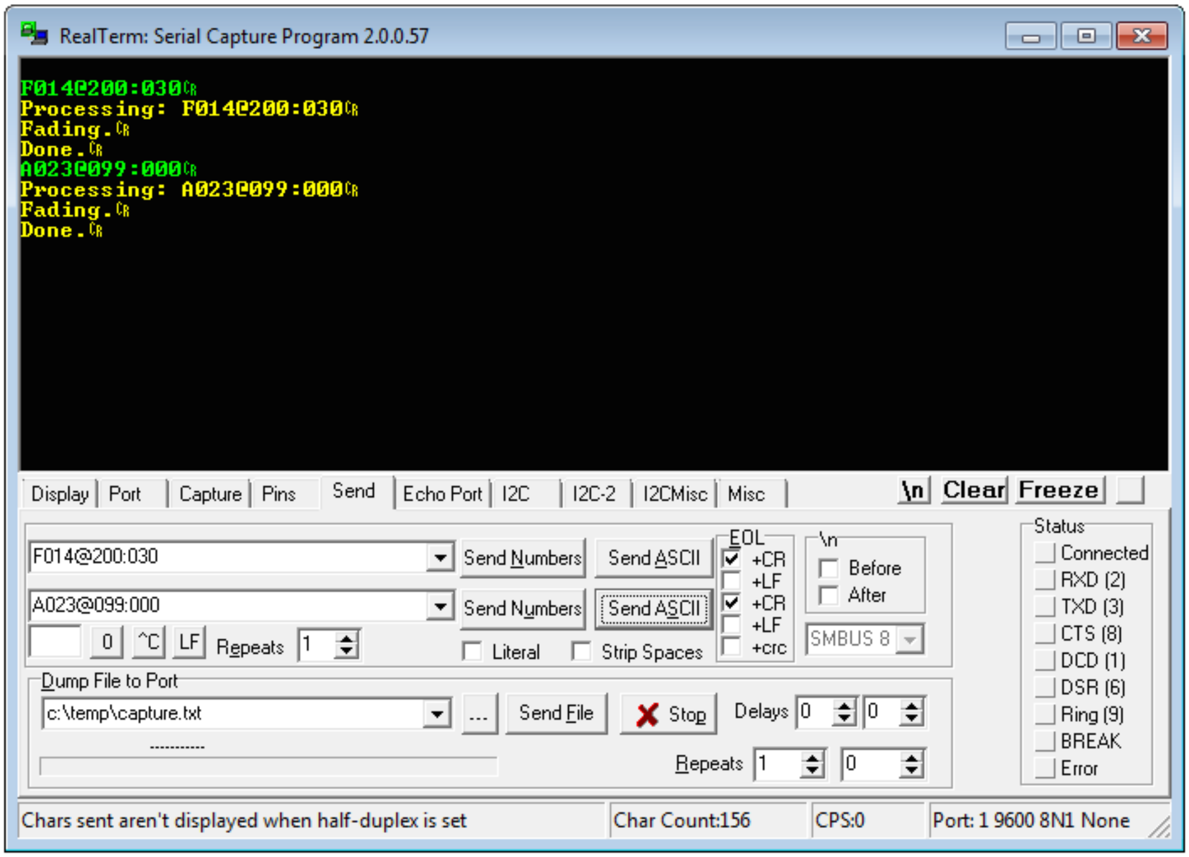
For 'A' commands, the channel:value information contained in each string a*dds to* data in the DMX output buffer. Higher values take precedence. Thus, lighting data may be added to existing scenes a few channels at a time. In a photo editing application, this process would be similar to adding layers to an image.

If a channel is not specifically mentioned in an A command, its value remains the same as it as before the command was processed.

```
F001@100:000[cr]
A002@255:000[cr]
A010@128,011@127,012@126:024[cr]
A007@010:010[cr]
```

... the DMX output buffer would have the following values:

CH1 : 100
CH2 : 255
CH10 : 128
CH11 : 127 CH12 : 126 CH7 : 10



RealTerm: Serial Capture Program 2.0.0.57

```
F014@200:030␍
Processing: F014@200:030␍
Fading.␍
Done.␍
A023@099:000␍
Processing: A023@099:000␍
Fading.␍
Done.␍
```

F014@200:030

A023@099:000

EOL ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

\n ☐ Before ☐ After

Repeats 1

☐ Literal ☐ Strip Spaces

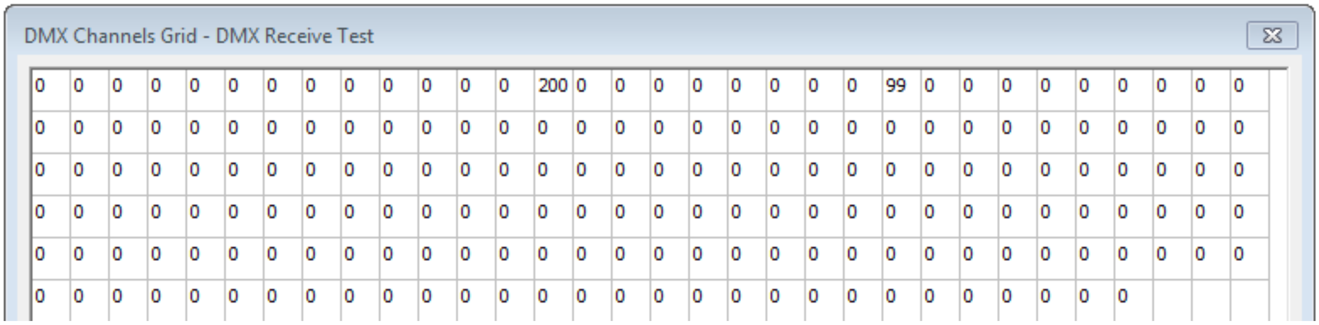
Dump File to Port: c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Status: ☐ Connected ☐ RXD (2) ☐ TXD (3) ☐ CTS (8) ☐ DCD (1) ☐ DSR (6) ☐ Ring (9) ☐ BREAK ☐ Error

Chars sent aren't displayed when half-duplex is set | Char Count:156 | CPS:0 | Port: 1 9600 8N1 None



DMX Channels Grid - DMX Receive Test

0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0	99	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			

STORING A SCENE

```
MXXX[cr]
```

Up to 63 DMX scenes may be saved in memory.   A scene is a copy of the current DMX output buffer. This memory is permanent and will survive a power cycle.

Typically, a group of 'F' or 'A' commands will be used to build a particular lighting scene. Once the desired look has been achieved, it can be stored in memory for future use. This greatly reduces programming and execution time.

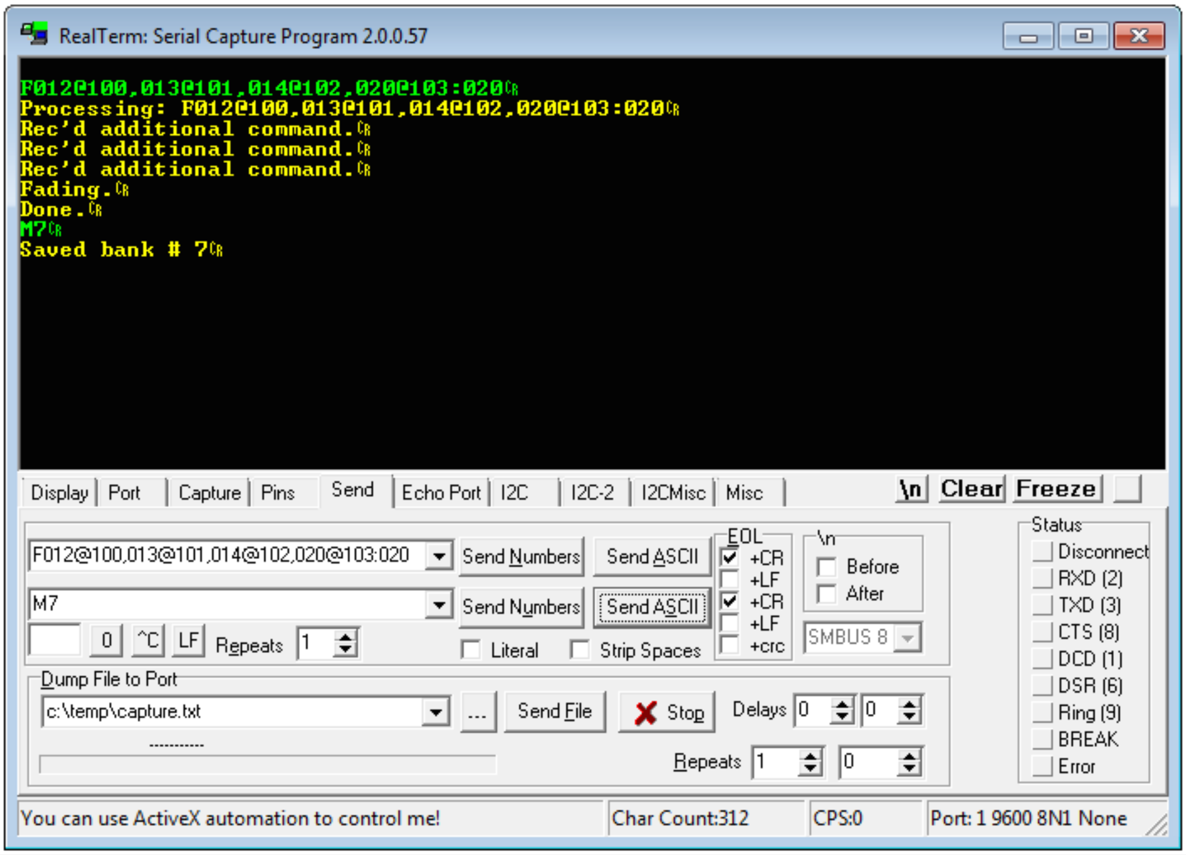
There are no *write protect* settings. Any scene may be, at any time, re-recorded with an M command. Previously stored data in that memory bank will be replaced.

For example, following the completion of these commands:

```
F001@100:000[cr]
A002@255:000[cr]
A010@128,011@127,012@126:024[cr]
A007@010:010[cr]
M22[cr]
```

... the DMX output buffer would have the following values: CH1 : 100

CH2 : 255
CH10 : 128
CH11 : 127 CH12 : 126 CH7 : 10
...
and memory bank #22 may be recalled at any time in the future.



RealTerm: Serial Capture Program 2.0.0.57

```
F012@100,013@101,014@102,020@103:020␍
Processing: F012@100,013@101,014@102,020@103:020␍
Rec'd additional command.␍
Rec'd additional command.␍
Rec'd additional command.␍
Fading.␍
Done.␍
M7␍
Saved bank # 7␍
```

F012@100,013@101,014@102,020@103:020 | Send Numbers | Send ASCII

M7 | Send Numbers | Send ASCII

Repeats 1

□ Literal □ Strip Spaces

EOL: ☑ +CR □ +LF ☑ +CR □ +LF □ +crc

\n: □ Before □ After

SMBUS 8

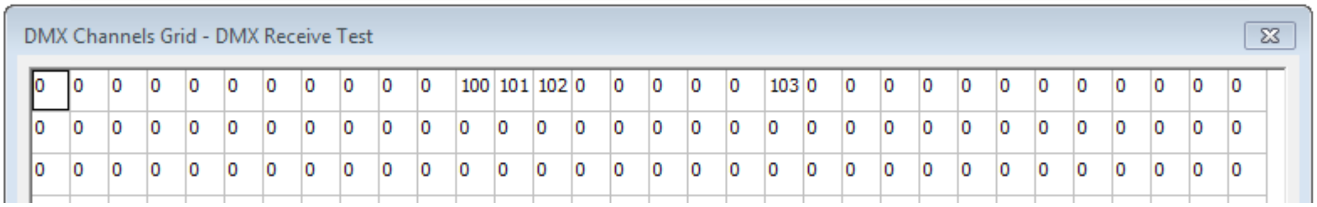
Dump File to Port: c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Status: □ Disconnect □ RXD (2) □ TXD (3) □ CTS (8) □ DCD (1) □ DSR (6) □ Ring (9) □ BREAK □ Error

You can use ActiveX automation to control me! | Char Count:312 | CPS:0 | Port: 1 9600 8N1 None



DMX Channels Grid - DMX Receive Test

0	0	0	0	0	0	0	0	0	0	0	100	101	102	0	0	0	0	0	103	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RECALLING A STORED SCENE

```
SXXX:TTT[cr]
```

- S is a capital S
- XXX is the desired scene number, valid range is [1 063]
- TTT is the scene crossfade time, valid range is [000 999] tenths of a second

Up to 63 DMX scenes may be saved in memory. This memory is permanent and will survive a power cycle. Scenes may be recalled from memory and faded in over a specific time. Scene recall commands *overwrite* the DMX output buffer with stored data. Using this basic command, all channels are changed from their 'live' value to that which was stored in memory.

Example: recall stored scene #1 instantly:

```
S001:000[cr]
```

Example: crossfade from the current DMX output buffer with the contents of scene 32 over 5.7 seconds:

```
S032:057[cr]
```

However, in some instances it is desirable to recall a stored scene, but only apply it to part of a DMX universe. For example, consider a three-room home automation installation. Each room uses 15 channels of DMX for RGB accent lighting. It might be useful to recall a scene but only apply that data to a specific range of DMX channels. One room can change color while leaving the other rooms unaffected.

For that purpose, the S command can be overloaded with mask values:

```
SXXX:TTT,L,H[cr]
```

In this case, L and H represent the lower and upper bounds of the DMX channel range to be copied from system memory to the constantly repeating DMX output buffer. Other valid commands could include:
Recall scene six, three second crossfade.

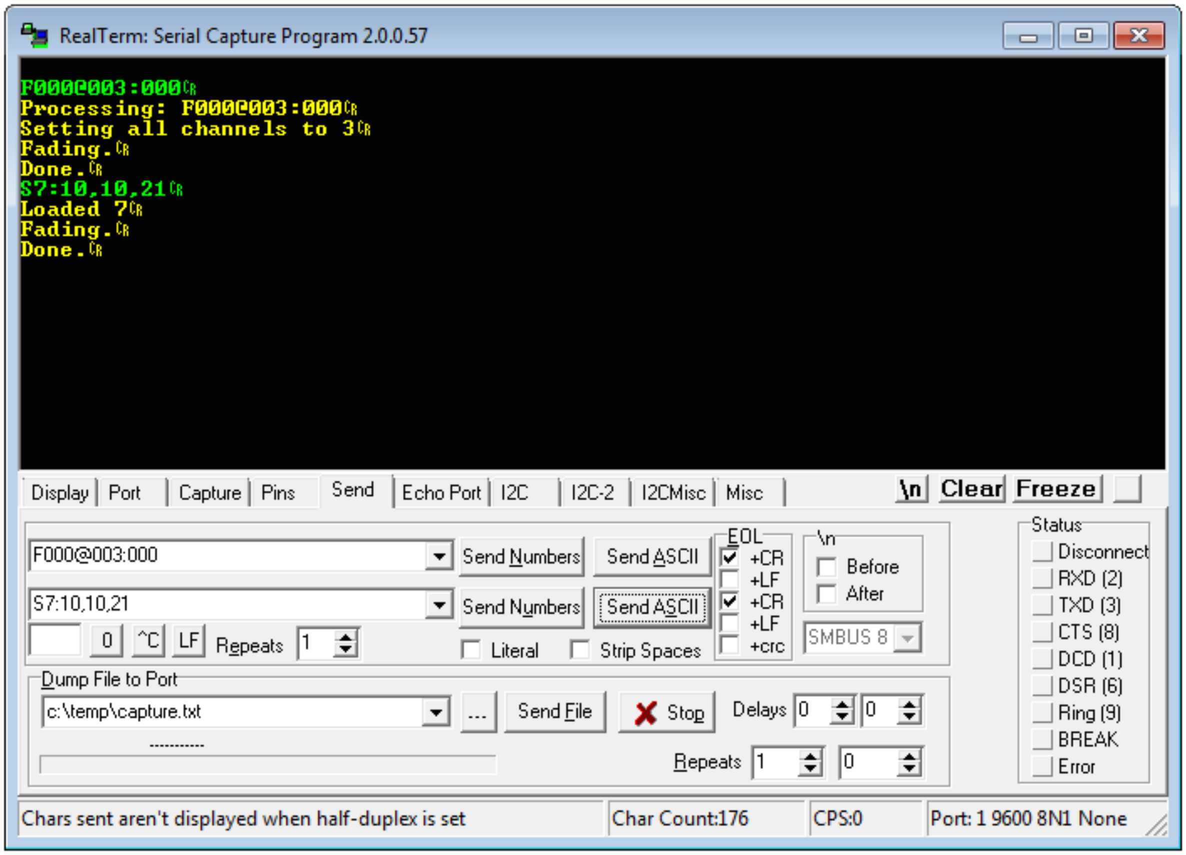
```
S6:030[cr]
```

As above, but only copy channels between 10 and 30 from memory to the DMX output buffer:

```
S6:030,10,30[cr]
```

As above, but only copy channels 100-150 from memory to output. All other channel information carries through. Zero fade time.

```
S6:000,100,150[cr]
```



```
F000@003:000␍
Processing: F000@003:000␍
Setting all channels to 3␍
Fading.␍
Done.␍
S7:10,10,21␍
Loaded 7␍
Fading.␍
Done.␍
```

F000@003:000

S7:10,10,21

Repeats 1

EOL ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

\n ☐ Before ☐ After

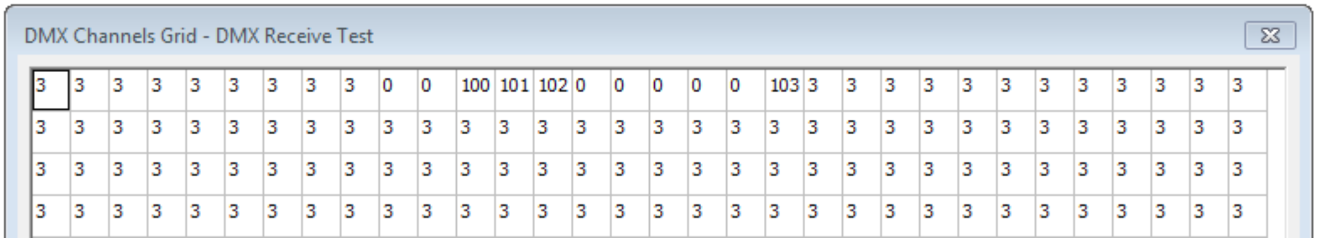
☐ Literal ☐ Strip Spaces

c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Chars sent aren't displayed when half-duplex is set | Char Count:176 | CPS:0 | Port: 1 9600 8N1 None


DMX Channels Grid - DMX Receive Test

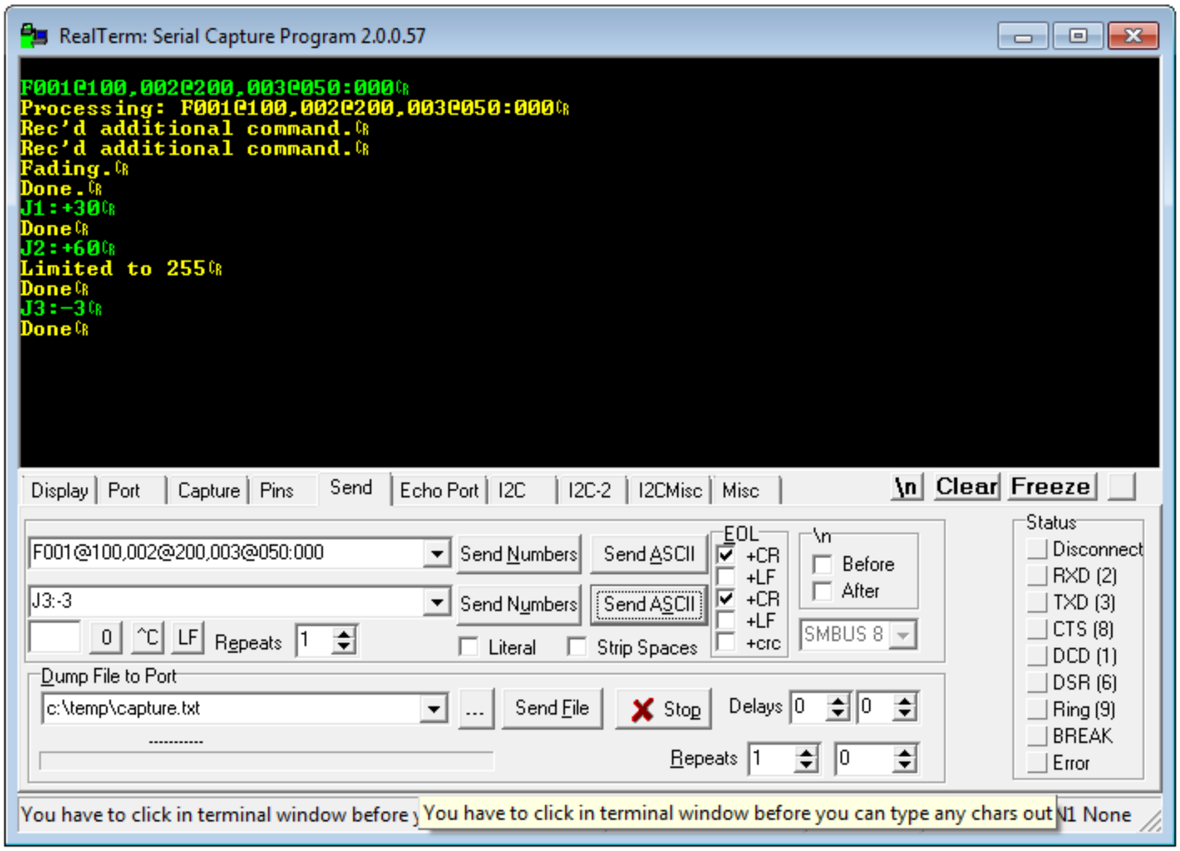
3	3	3	3	3	3	3	3	3	0	0	100	101	102	0	0	0	0	0	103	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

JOG A CHANNEL

Individual DMX channels may be jogged up and down. In this mode, it is not required to know the channel's exact value. Rather, it can be added to or subtracted from in arbitrary amounts, up to the limits of 0 or 255. This command may be useful when implementing bump buttons on a human interface control panel.

```
JN:X[cr]
JN:-X[cr]
JN:+X[cr]
```

- J is a capital J
- N is the DMX channel number, range is [1 512]
- X is a decimal number, either positive or negative
- [cr] is a carriage return.



RealTerm: Serial Capture Program 2.0.0.57

```
F001@100,002@200,003@050:000␍
Processing: F001@100,002@200,003@050:000␍
Rec'd additional command.␍
Rec'd additional command.␍
Fading.␍
Done.␍
J1:+30␍
Done␍
J2:+60␍
Limited to 255␍
Done␍
J3:-3␍
Done␍
```

F001@100,002@200,003@050:000

J3:-3

Repeats 1

Dump File to Port: c:\temp\capture.txt

EOL: ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

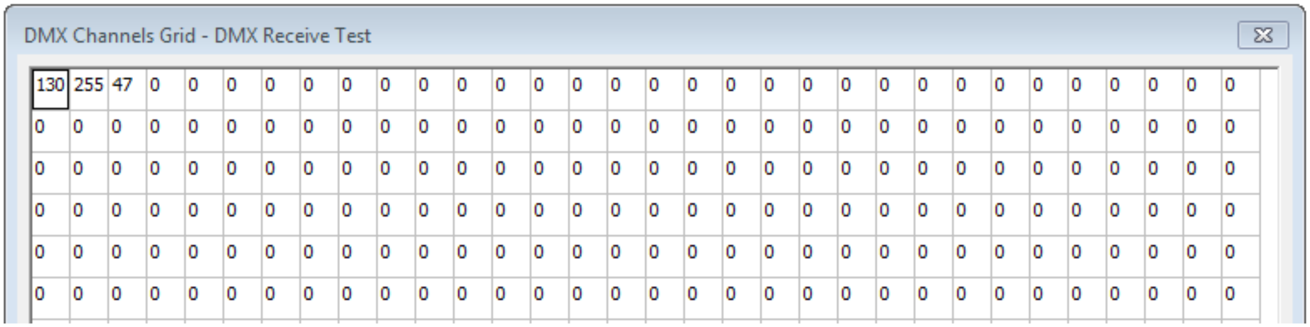
\n: ☐ Before ☐ After

☐ Literal ☐ Strip Spaces

Delays 0 0

Repeats 1 0

You have to click in terminal window before you can type any chars out



DMX Channels Grid - DMX Receive Test

130	255	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

STREAMING MODE

In this mode, it's possible to transmit data directly to the DMX output buffer, with a bare minimum of protocol overhead.

The first step is to tell the system how many channels will be transmitted. This is called the 'streaming mask.' Since it may not be necessary or even desirable to control an entire universe at one time, a selection of channels may be chosen. The command is

```
X:LLL:SSS[cr]
```

- X is a capital X
- LLL is a three digit lower-bound of the DMX range to control. Leading zeroes should be included.
- SSS is the size of the mask, in DMX channels.

For example, to control channels 1-10

```
X:001:10[cr]
```

… and to control channels 1-300

```
X:001:300[cr]
```

To control channels 30-45

```
X:030:15[cr]
```

A query command can also be sent:

```
X?[cr]
```

The system will return the current channel mask. Default is [1 512] at powerup, and masks are not saved through a power cycle.

Once the range has been set, data can be sent directly to the serial port. Some care is required on the part of the user, however. A set of streaming data begins with the character 'x' and then is followed by binary bytes, the number of which corresponds to the channels being controlled.

When 'x' is received, the system begins counting subsequently-received bytes and storing them in a temporary buffer. When the appropriate number of bytes have been received, the temporary buffer is copied to the DMX output buffer. DMX channels which fall outside the streaming mask are unaffected.

Any number of streaming packets may be sent, provided that their length is sized appropriately. If more channels are sent than were originally specified, errors will be returned.

Here are a few examples.

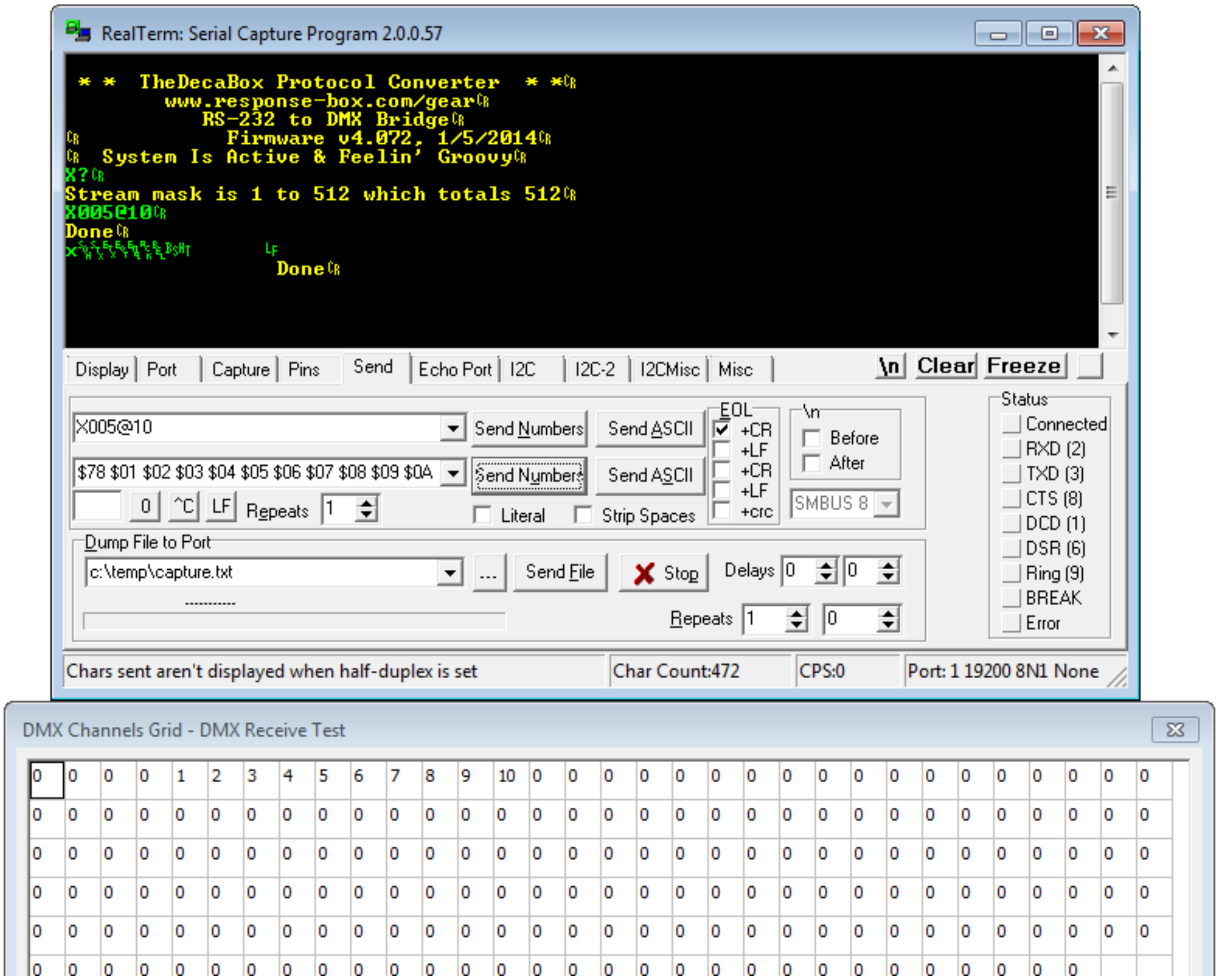
For ease of reading on the printed page, $XX is used to denote a single binary byte, and whitespace is included here only for clarity.

Operate on DMX channels [5 13]

```
X005:8[cr]
```

Send 9 bytes total, which affect DMX channels 5-13

```
x $01 $02 $03 $04 $05 $06 $07 $08
```



RealTerm: Serial Capture Program 2.0.0.57

```
 * *  TheDecaBox Protocol Converter  * *␍
        www.response-box.com/gear␍
           RS-232 to DMX Bridge␍
␍             Firmware v4.072, 1/5/2014␍
␍  System Is Active & Feelin' Groovy␍
X?␍
Stream mask is 1 to 512 which totals 512␍
X005@10␍
Done␍
x␁␂␃␄␅␆␇␈␉           ␊
                 Done␍
```

X005@10

$78 $01 $02 $03 $04 $05 $06 $07 $08 $09 $0A

EOL ☑ +CR ☐ +LF ☐ +CR ☐ +LF ☐ +crc

\n ☐ Before ☐ After

Repeats 1

☐ Literal ☐ Strip Spaces

Dump File to Port c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Status: Connected, RXD (2), TXD (3), CTS (8), DCD (1), DSR (6), Ring (9), BREAK, Error

Chars sent aren't displayed when half-duplex is set | Char Count:472 | CPS:0 | Port: 1 19200 8N1 None

DMX Channels Grid - DMX Receive Test

0	0	0	0	1	2	3	4	5	6	7	8	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Clear All Channels, No Delay, No Fade Time

```
C[cr]
```

Reset

```
I[cr]
```

Initiates a software reboot, which has the same effect as a physical power cycle.

SET SYSTEM BAUD RATE

```
B9600[cr]
B19200[cr]
B38400[cr]
B57600[cr]
B115200[cr]
```

Change takes place after a power cycle or software reset.

Query Current DMX Values

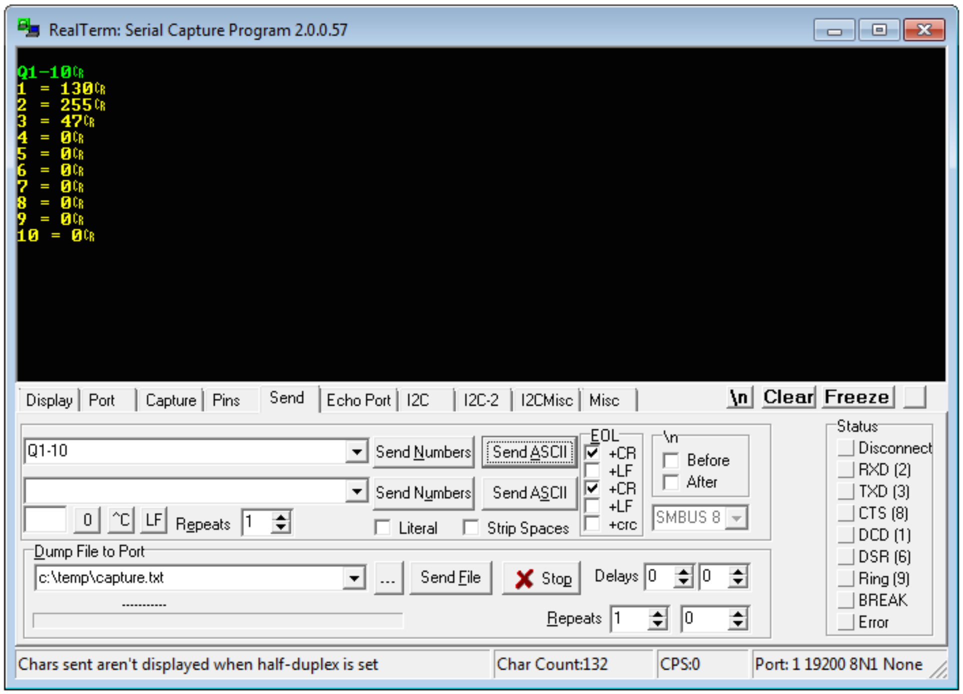
```
QXXX-YYY[cr]
QA[cr]
```

QA returns a neatly organized list of all DMX channel:value combinations, ranging from [1 512].

QXXX-YYY returns a subset of those channels. XXX may range from [1 512] and YYY may also range from [1 512] The commands

```
Q100-100[cr]
Q70-35[cr]
Q35-70[cr]
```

are all valid, and will return data in the numerical order requested. In the case of the first command above, only information about DMX channel 100 is returned.



RealTerm: Serial Capture Program 2.0.0.57

```
Q1-10CR
1 = 130CR
2 = 255CR
3 = 47CR
4 = 0CR
5 = 0CR
6 = 0CR
7 = 0CR
8 = 0CR
9 = 0CR
10 = 0CR
```

Q1-10

EOL: ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

\n: ☐ Before ☐ After

☐ Literal ☐ Strip Spaces

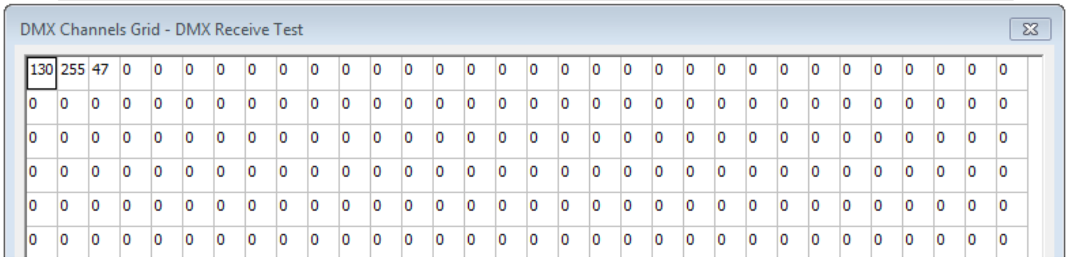
Repeats 1

Dump File to Port: c:\temp\capture.txt

Delays 0 0

Repeats 1 0

Chars sent aren't displayed when half-duplex is set | Char Count:132 | CPS:0 | Port: 1 19200 8N1 None



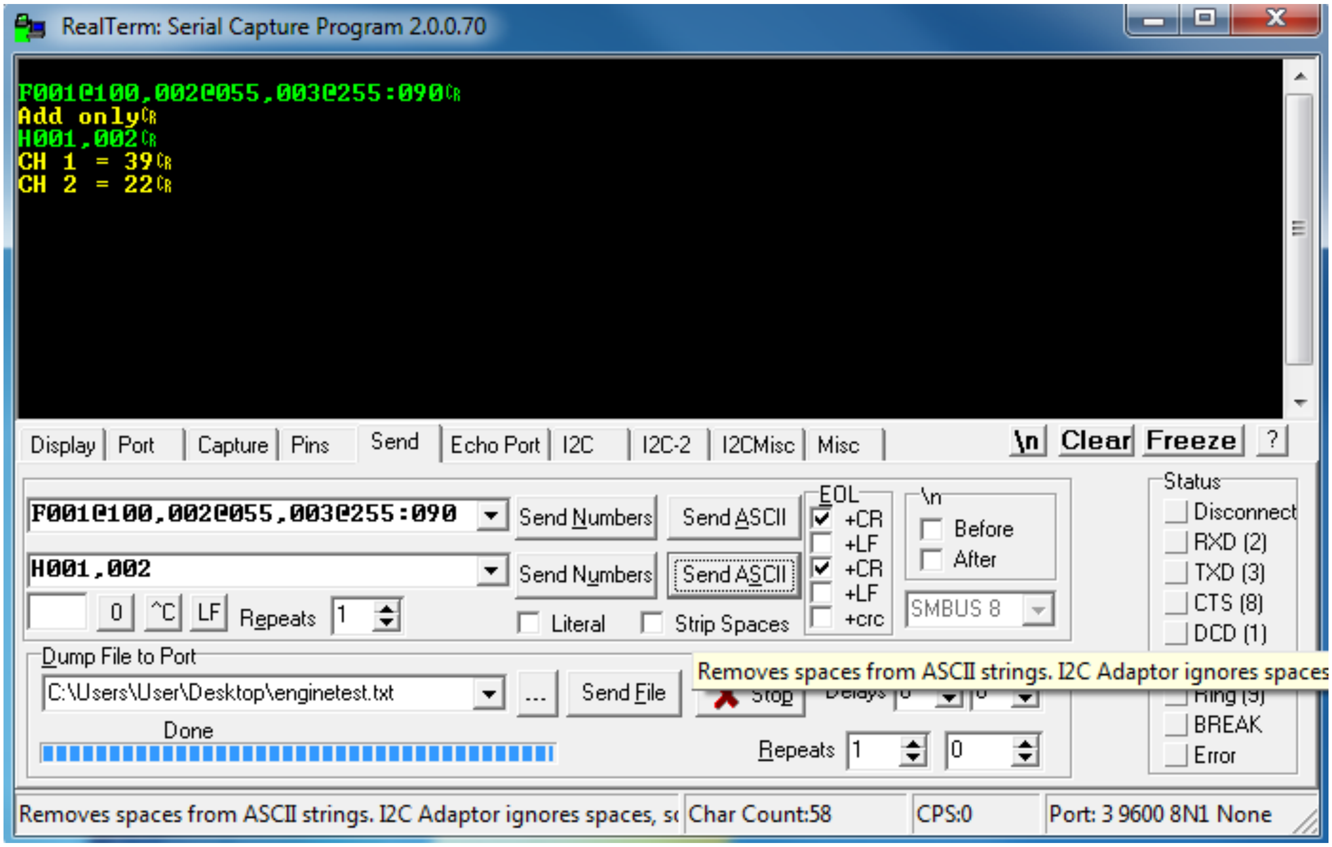
DMX Channels Grid - DMX Receive Test

130	255	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Halt

Hx[cr]
Hx,y,z…[cr]

The halt command pauses specific channels mid-fade.   It also returns the value of the paused channels in an easy-to-parse format. This command use useful when building human interface panels. Channels can be set to fade slowly to a certain point, and the operator can pause or stop the fade when the desired levels are reached.



RealTerm: Serial Capture Program 2.0.0.70

```
F001@100,002@055,003@255:090␍
Add only␍
H001,002␍
CH 1 = 39␍
CH 2 = 22␍
```

F001@100,002@055,003@255:090

H001,002

EOL: ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

\n: ☐ Before ☐ After

☐ Literal ☐ Strip Spaces

Repeats 1

Dump File to Port: C:\Users\User\Desktop\enginetest.txt

Done

Repeats 1 0

Removes spaces from ASCII strings. I2C Adaptor ignores spaces

Removes spaces from ASCII strings. I2C Adaptor ignores spaces, s | Char Count:58 | CPS:0 | Port: 3 9600 8N1 None

Simultaneous Fade Speeds in One Command

ZXXX@YYY:T111,ZAAA@BBB,T22,ZCCC@DDD:T33[cr]

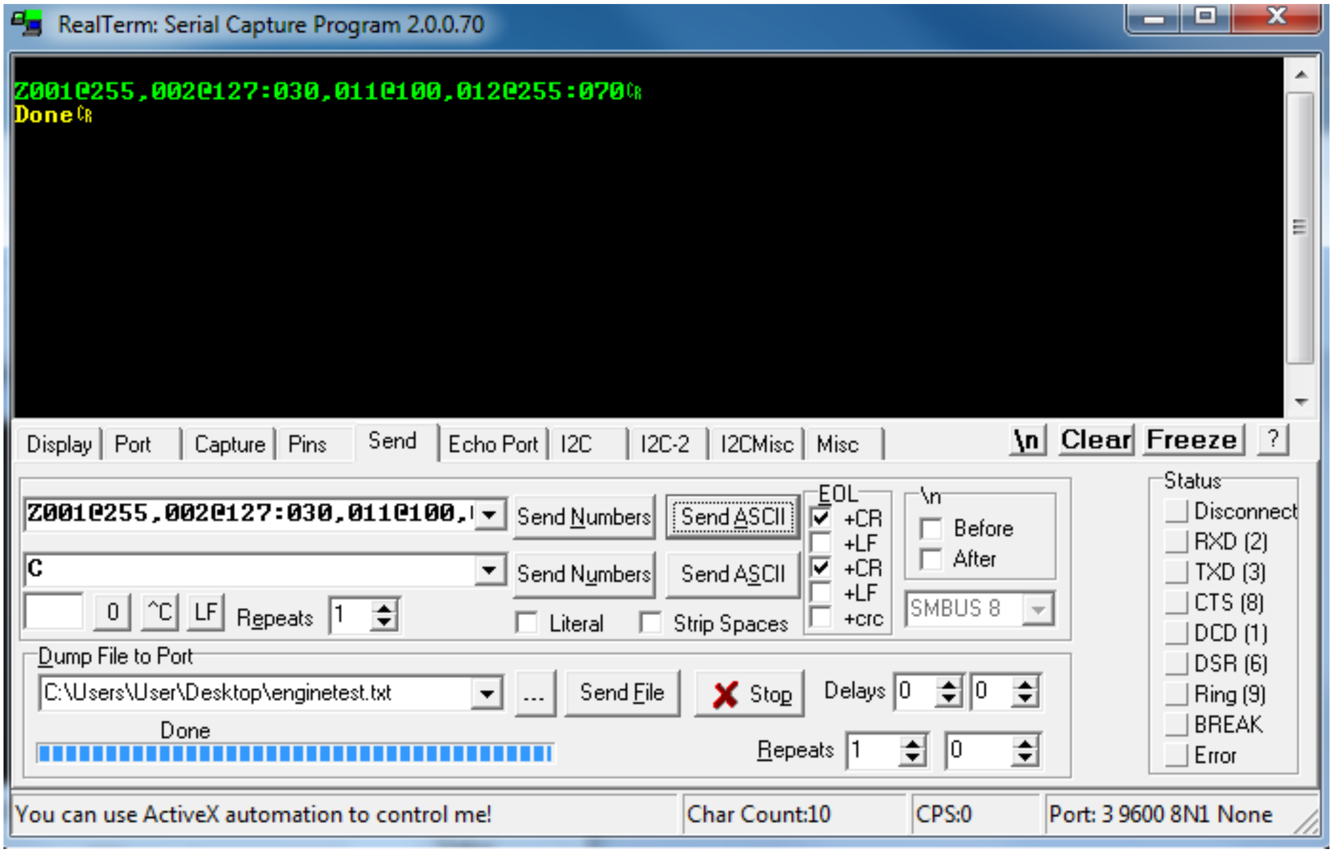
Although the system can execute commands simultaneously and in parallel, some designers requested the ability to send fades at multiple speeds in a single command. Z command acts similarly to the A command, in that the DMX output buffer is not completely overwritten.

Channel numbers, channel levels and fade speeds *must* be 3-digit decimal values. Leading zeros may be required.

Note that the RS-232 receive buffer is 512 characters long.

This command sets channels to levels at three different and simultaneous speeds:

```
 Z001@255,002@127,003@064:010,004@127,005@255:030,
011@100,012@127,013@200,019@255:070[cr]
```



RealTerm: Serial Capture Program 2.0.0.70

```
Z001@255,002@127:030,011@100,012@255:070␍
Done␍
```

Z001@255,002@127:030,011@100,|

C

Repeats 1

EOL ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

\n ☐ Before ☐ After

☐ Literal ☐ Strip Spaces

Dump File to Port: C:\Users\User\Desktop\enginetest.txt

Done

Delays 0 0

Repeats 1 0

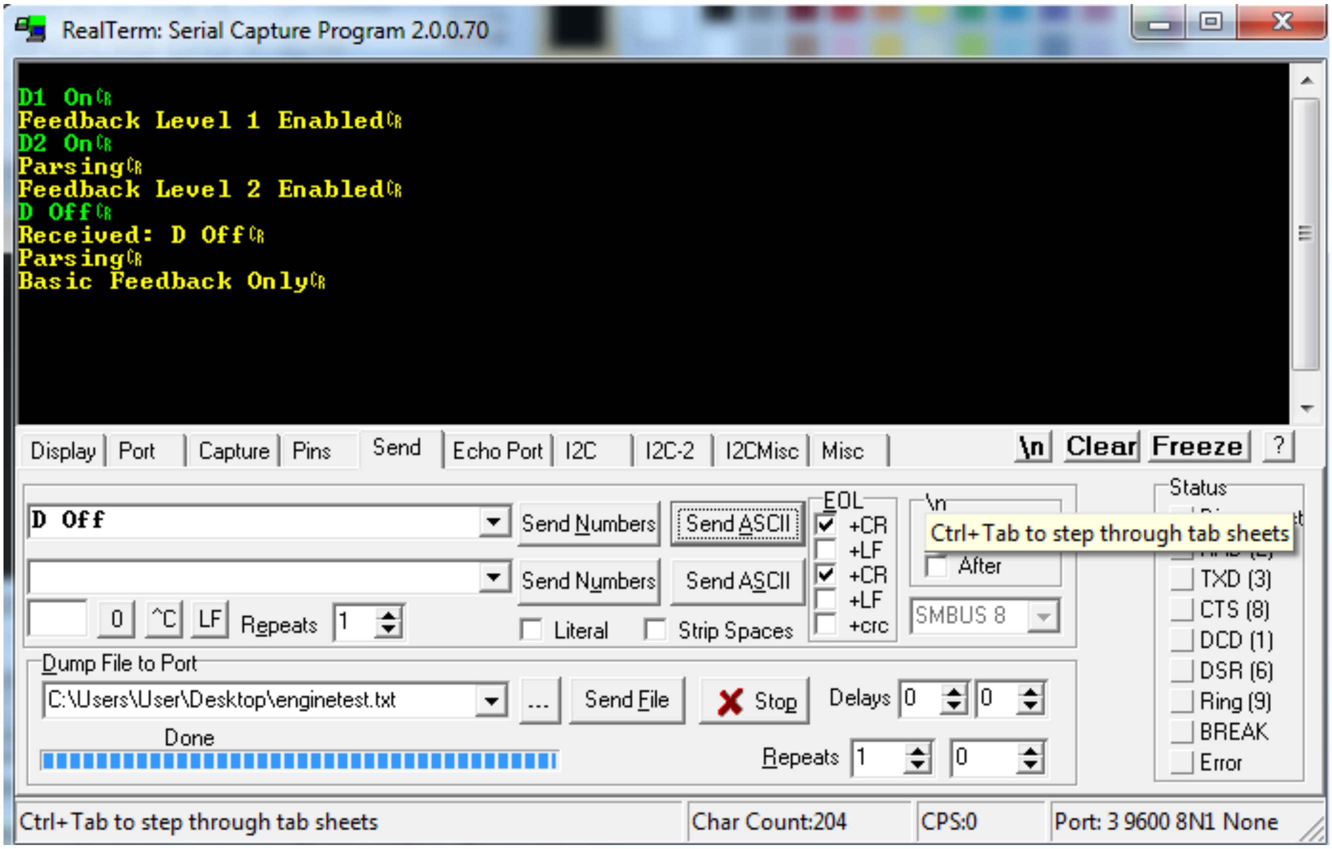
You can use ActiveX automation to control me! | Char Count:10 | CPS:0 | Port: 3 9600 8N1 None

Debug Verbosity

The system generates feedback through the RS-232 port. This feedback can be used to troubleshoot a program if needed. There are multiple levels of feedback available.

```
D1 On[cr]
D2 On[cr]
D Off[cr]
```

The debug value defaults to D1 (simple feedback) after a power cycle. D2 is more verbose, and can be toggled on or off as needed.



RealTerm: Serial Capture Program 2.0.0.70

```
D1 On␍
Feedback Level 1 Enabled␍
D2 On␍
Parsing␍
Feedback Level 2 Enabled␍
D Off␍
Received: D Off␍
Parsing␍
Basic Feedback Only␍
```

D Off

EOL ☑ +CR ☐ +LF ☑ +CR ☐ +LF ☐ +crc

Dump File to Port: C:\Users\User\Desktop\enginetest.txt

Done

Delays 0 0

Repeats 1 0

Ctrl+Tab to step through tab sheets | Char Count:204 | CPS:0 | Port: 3 9600 8N1 None