DiosPro Operations and Volume Index

DiosPro Manual Series
Volume 1

Kronos Robotics and Electronics

www.KronosRobotics.com

DiosPro Manual

Version 3.5

Updates

Software and updated manuals can be obtained from the Kronos Robotics web site located at www.kronosrobotics.com.

Forums

A web-based discussions board is located at one of the Kronos Robotics sister sites. These forums cover everything from the Dios product line to motor controller basics and robotics. They are located at: www.mgsweb.com/forum.

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web: www.kronosrobotics.com

Kronos Robotics and Electronics

Welcome

Welcome to the world of the Dios.Dios chips, modules and boards are tiny computers (microcontrollers) complete with memory and IO ports. They have built-in hardware features such as timers, PWM generators and an interrupt driven hardware UART. Some modules and boards have built in regulator and PCinterface. The Dios Ultra Board even has a built in LCD interface as well as provisions for buttons, EEprom, and Real Time Clock.

The Dios provides 22-33 IO lines depending on the chip, module or board used. They have a built-in command set capable of running several thousand instructions per second. Several interrupts and in-line assembly are supported.

Table of Contents

Using the DiosPro Editor

DiosPro Hookup

Charts and Tables

Volume Index

Volume 1
Dios Operations and Volume Index

Volume 2
Dios Command Syntax

Volume 3
Dios Function Libraries

Volume 4
DiosPro Language Tutorial

Introduction

In order to program the Dios chips and modules you will need the Dios software. This software is free and can be downloaded from the Kronos Robotics web site at www.kronosrobotics.com.

The Dios Editor may also be used with the DLC. When used with the DLCthe functionality is identical save for a few options available to the DLC on the compiler form.

The Dios Editor Software has many utilities to help you manage your files and libraries. There is even a conversion utility to help you do binary, hex and decimal conversions.

The Dios Editor is also used to upgrade the Dios Chips.

System Requirements

•266Mhz system
•Windows 98,Me,NT4,2000,XP
•64Mb of Ram
•20Meg Disk Space
•CD-ROM if loaded from CD
•Internet connection if downloaded from Website
•Serial port capable of 115200 speed.
•Graphics Card capable of 800x600

Software Installation

Insert the CD into CD-ROM. The installation will start automatically. Once installation starts follow the instructions. If auto insertion is turned off you will have to manually install the software. To do this open up the CD-ROM drive and double click the program labeled DiosSetup.exe.

If you are installing over top of a previous version then you must remove the old version first. You will be prompted with three options. Select the **Remove** option and click next. Once removal is complete, reinsert the CD and install as normal.

Note: if prompted to remove shared components, answer yes and continue.

Using the Software

When the Dios Editor is started the Dios File Manager form is loaded.

This form is used to keep track of the last 50 programs that you have edited.

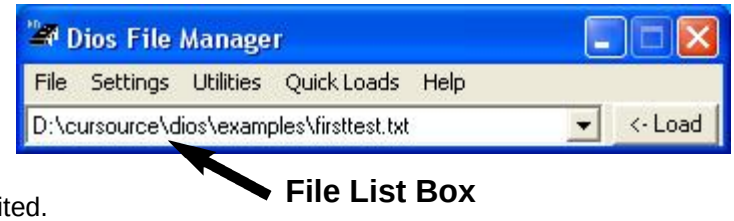


Figure 1.1: File Manager

Recent Files

Each time you edit a file it will be placed in the file list box. All other files in the list box will be shiffted down. If the file is already in the list box it will be moved to the top of the list. To load the file just hit the **<- Load** button.

As a special feature the Dios will keep track of the window size and location of each of the last 50 files located in the list box.

Minimizing the Dios Software

When you minimize the Dios File Manager all Dios Forms will be minimized. Once the File manager is restored all the minimized forms will be as well.

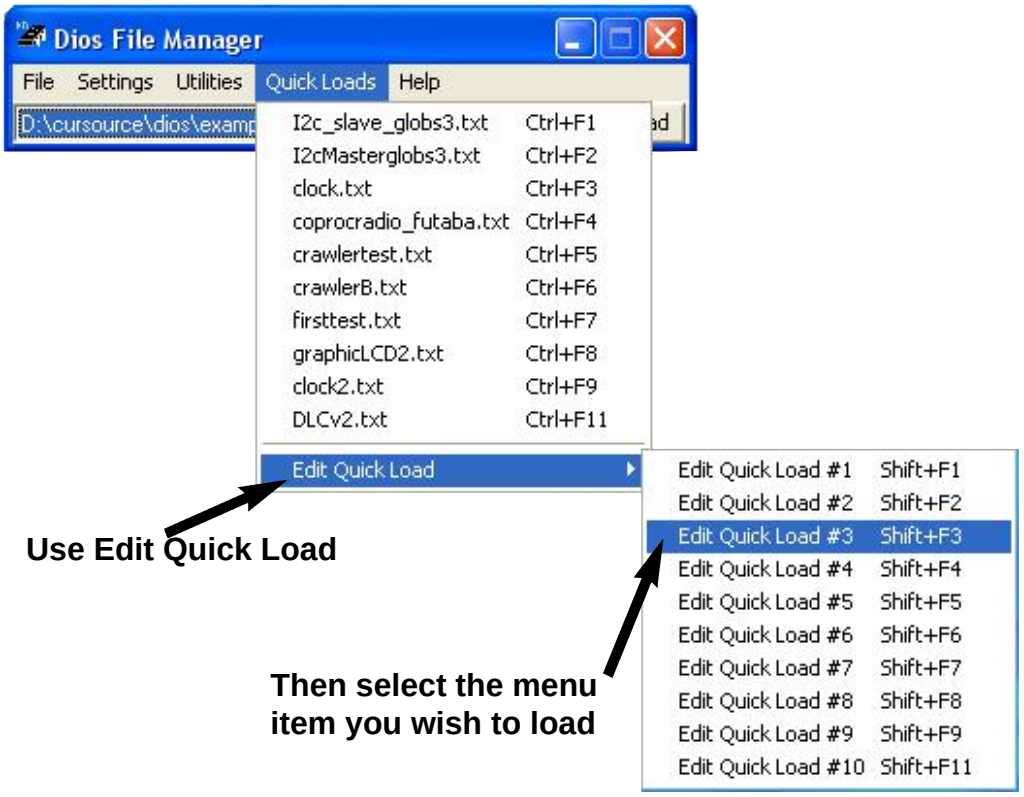
When you shutdown the Dios software it will remember what forms were open and thier locations. They will all be opened in the same position. This will allow you to take up whe you left off during your last session.

Quick Loads

There are 10 quick load menu selections. You can use these to place 10 of your most use programs or templates.

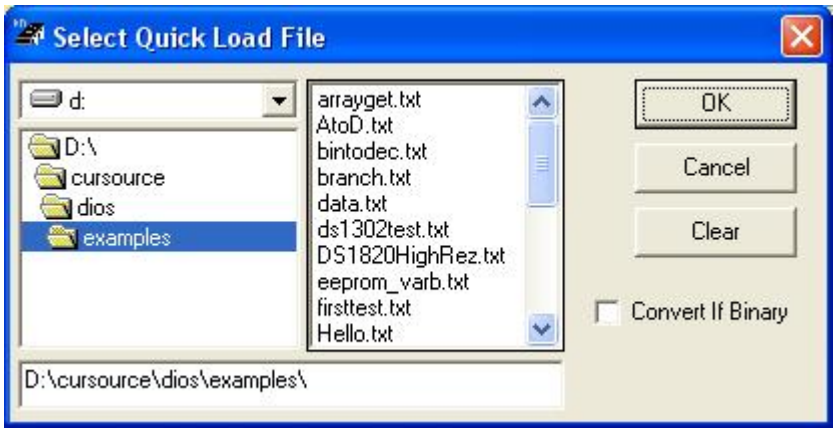
To place a file into one of the quick load locations use the **Edit Quick Load** option under the **Quick Loads** menu.

Figure 1.2: Quick Loads



Once you have selected a menu item to change you will be presented with file selection form. Highlight the file you would like to place in the Quick Load and click **OK**.

Figure 1.3: Quick Loads File Selection Form



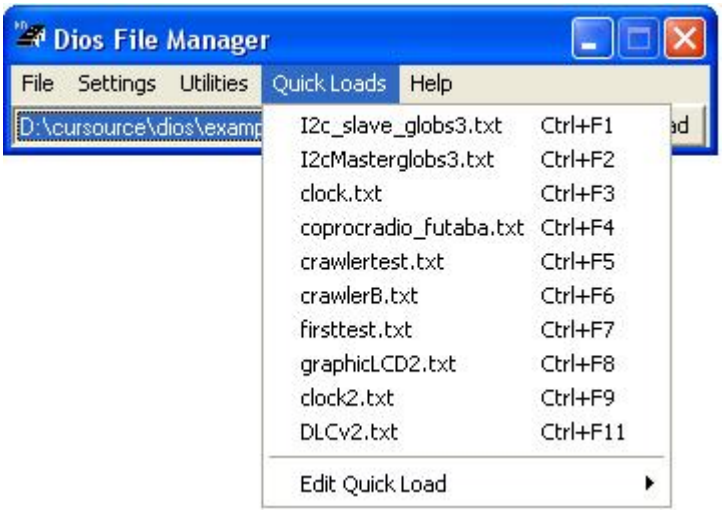


Figure 1.4: Select a Quick Load menu item

Once you have loaded your Quick Load menu items It's as simple as picking the item from the list. You can also use one of the hot keys any time the Dios File Manager is active.

You can also open an existing file or create a new one by using the **New Dios File** and **Open Dios File** options under the File menu.

Changing the Com Port

There are times when you may need to change the com port your PCuses to communicate with the Dios Ultra and the DLC. This is done with the **Change Com Port** option in the Settings menu on the File Manager.

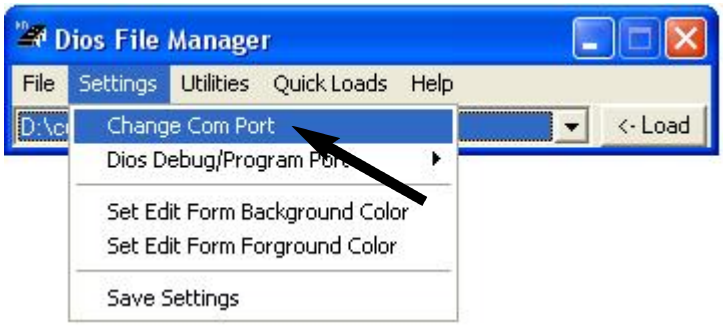


Figure 1.5: Select Change Com Port

Figure 1.6: Change Com Port

To test the com port for proper operation connect a Dios Ultra or DLC to the PC and select a port to test. Click the Dios Test button. If the PCdetects a DLC or Dios Ultra the test will pass. If not you will get a fail message.

Changing Dios Debug/Program Port

There are times when you need to change the Debug/Program port on a particular Dios Chip.

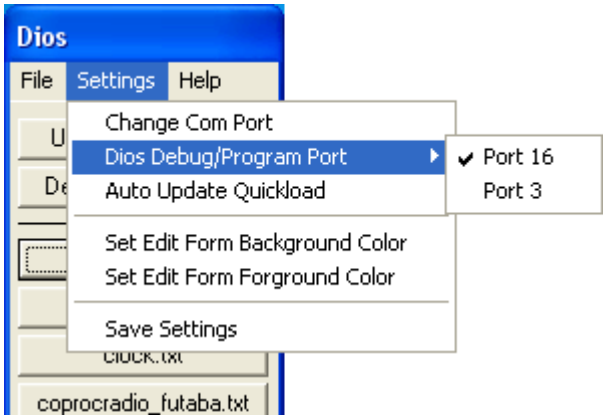


Figure 1.7: Change Debug Port

You can select IO port 16 or IO port 3 for the transmit debug port. This applies to the curre chip being programmed.

Note that if you change the port on any of the Dios Ultra modules or boards you will need to change the appropriate jumper settings on the Dios Ultra Board.

Upgrading the Dios Ultra

Each time the Dios Editor software is upgraded, the firmware of each chip must be upgrade as well. If it is not upgraded there is a good chance the chips may not function properly wit the new editor software.

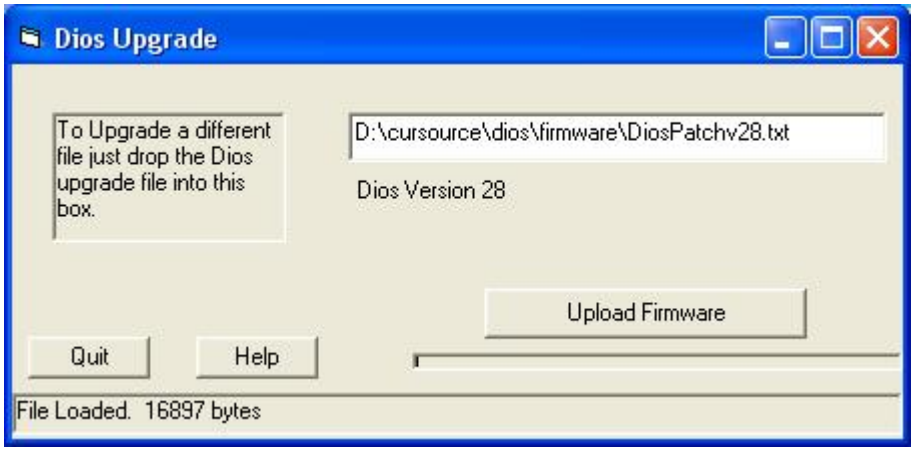


Figure 1.8: Dios Ultra Upgrades

To upgrade the software select the **Upgrade Dios Ultra Firmware** option from the **File menu.**

Important
•Always disconnect all external components such as motor controllers and other IO devices from the Dios Ultra chips before upgrading.
•Always stop all other process on your PC while updating your firmware.

Once the Dios Ultra chip is connected, just click the Upload Firmware button. When all you Dios Ultra chips are upgraded, click the **Quit** button to close the form.

Dios Libraries

One of the most powerful features of the Dios is the use of libraries.

Libraries make the job of creating reusable code very easy. Libraries are just normal Dios files with a .lib extension. By placing them in the lib directory they will automatically be managed by the Dios Libraries Manager.

To activate the library, select the Libraries item in the Utilities menu of the Edit form.

Dios Library Manager

When you double click on an item in the library list the help file will be loaded and presented. A Windows help file is looked for first. If not found a .txt file is looked for and presented. If no help file is located an error message will be presented.

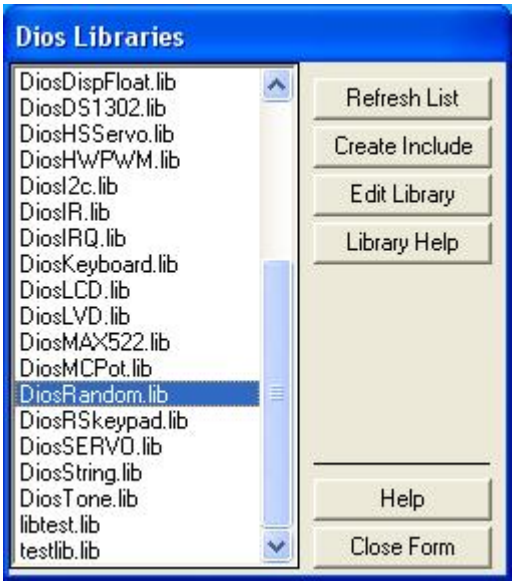


Figure 1.13: Library Manager

When you click the **Create Include** button it will place the correct include statement into the windows clipboard so you can paste it into your program.

To use the **Create Include** button first select the library from the list. Then click the **Create Include** button. Paste the the new include statement into your document. Normally we place libraries at the end of the current file.

You can also edit a library file by selecting it from the list and hitting the **Edit Library** button.

Figure 1.14: Double clicking on a, include file name will automaticly load that file in an edit form.

Note: If you use one of the functions included with the Dios Software and forget to add the include file it will be added to you source code automaticaly.

Changing the Edit Form Colors

You can change the foreground (font) and background color of the edit form by selecting the color menu items under the Settings menu.

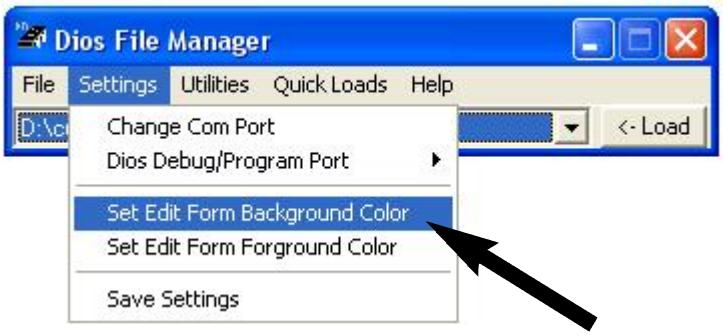


Figure 1.15: Change Edit Form Colors.

This will pop up a color form. Select the color for the background or font.

Figure 1.16: Color Picker

If you want the colors to become permanent make sure you save the settings. This option is located in the settings menu.

Conversion Utility

There is a built-in number conversion utility that will allow you to convert Hex, Decimal and Binary numbers. To load the conversion form select the Conversion menu item from the Utilities menu on the Edit Form or File Manager.

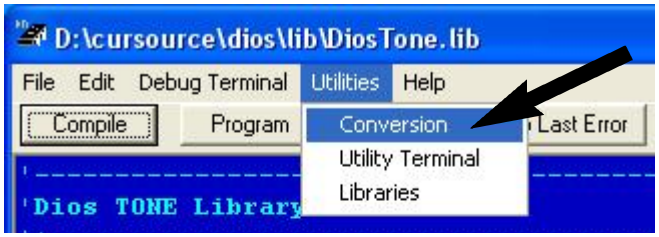


Figure 1.17: Select Conversion on Utilities menu.

The conversions are automatic. When you make a single digit change to any field all other fields will be updated.

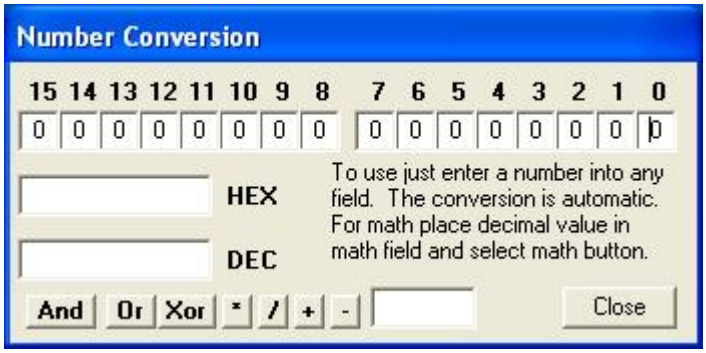


Figure 1.18: Number Conversion Form

We have also added the ability to do some basic math. Simply add an oppered to the math filed and hit one of the math keys.

Utility Terminal

The Utility Terminal is a simple communications terminal that allows you to set the baud rat
The other settings like data bits, parity, and stop bits are hard coded to 8N1.

Figure 1.19: Edit Form

To use the terminal select the baud rate and com port. The port must be an available port on your PC. It cannot be the same as the com port used for the debug terminal.

Once selected click the Open button. Once open, anything that is received will be displaye in the main text window. If you type a character in the main window it will be transmitted. You can also place ASCII values in the five small fields. Hit **Send** and the data will be transmitted.

Edit Form Overview

When you create a new DiosPro file you will be presented with an almost empty form. The actual contents of the new file is created from a file called template.txt located in the Dios directory. You may change this file to change the startup template if you wish.

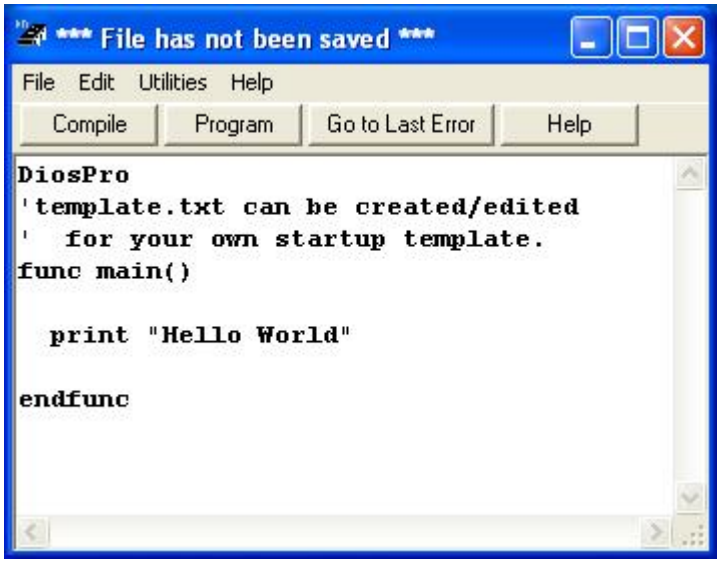


Figure 1.20: Utility Terminal

By using the items in the File menu you may save or print the contents of this form. You may also load a new file into this form.

You can also locate items in the form by using the Find and Find Next options in the Edit menu. Click the Debug Terminal menu to pop up the debug terminal.

The Utility Terminal, Library Manager and Conversion Utility can be accessed by selecting them under the Utility menu.

The Help menu presents you with the same help information as the File Manager.

Important

There is a current 64K text size limit in each Edit form. Once you file starts to approch this size simply place some of your functions in an include file.

Using the Edit Form

Use the edit form by placing the mouse in the form and typing. To compile your file, click the **Compile** button. the main difference between the**Compile** and **Program** buttons is that when the **Program** button is hit the Dios Ultra or DLC will be programmed once the compile process is complete.

Command Syntax Help

Any time you want some help about command, simply select the word and hit **F1**. A help form will pop up with a complete definition of the command.

If the word selected is not a valid command you will get a generic help form.

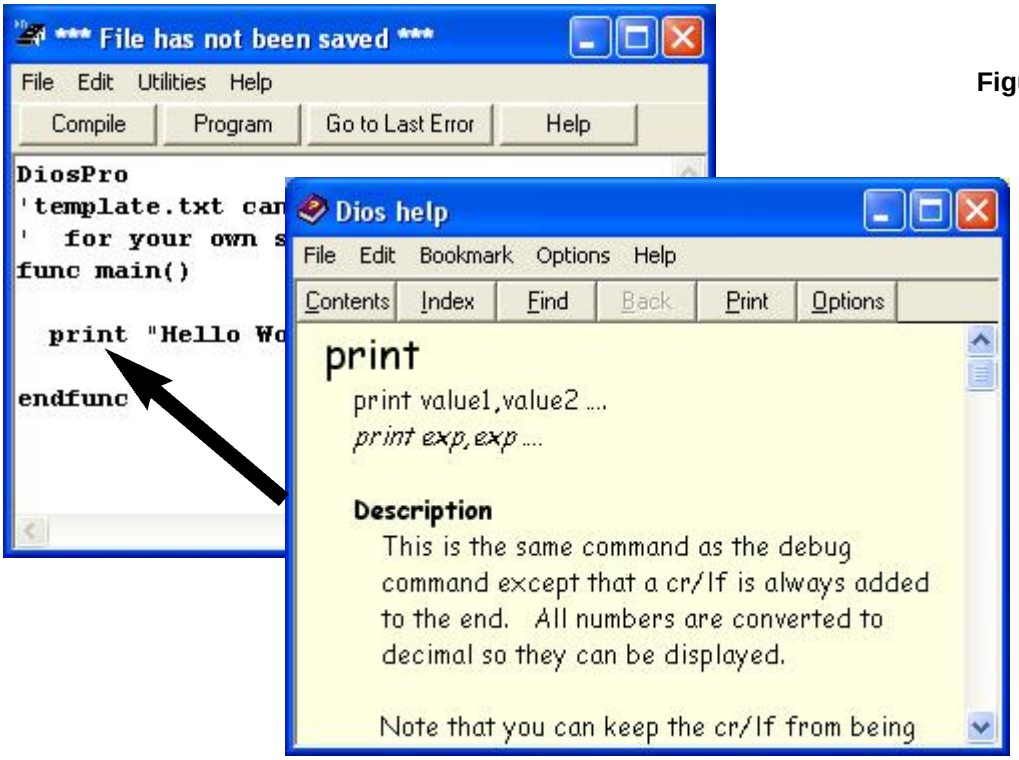


Figure 1.21: Command Help

Saving a File

To save a new file select the Save As in the File menu.

The Save File form will pop up. Select the directory and type in a file name. Always use a extension of .txt or .lib for your files. Once a location and file name is selected click the Sa File button.

Figure 1.22: Save File Form

Once the file has been saved the name of the file will be displayed at the top of the form.

The name will also be displayed on the top button on the File Manager.

Once a program is given a name, whenever that program is compiled or programmed it is saved automatically.

Compile Form Overview

When you compile or program a chip, the Dios Compiler form will pop up. This form presents you with various pieces of information about the compile process. If you are programming, the status of the program upload will also be shown.

The **Programmer** menu displays commands for resetting and powering the target chip. These features are used during in-circuit programming with the DLC. Under the Settings form you can enable the auto verify process.

Note that the program upload process will only begin if the compile does not encounter an error.

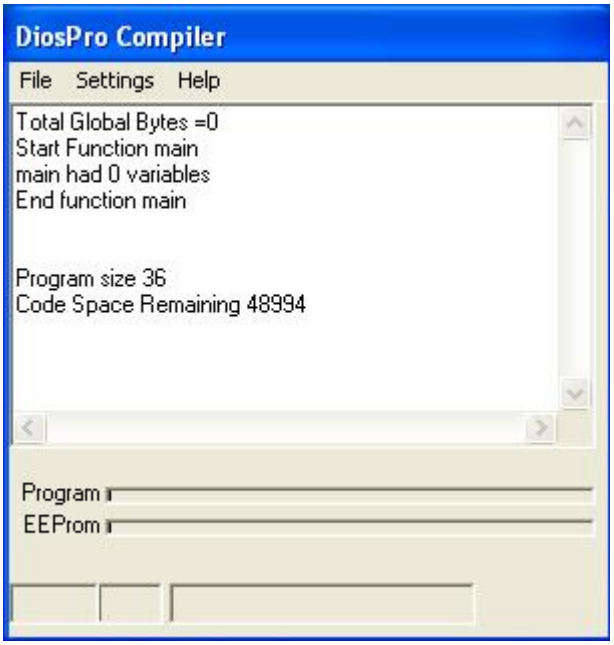


Figure 1.23: Compiler Form

Handling a Compile Error

When you encounter a compile error, click the **Go to Last Error** button.

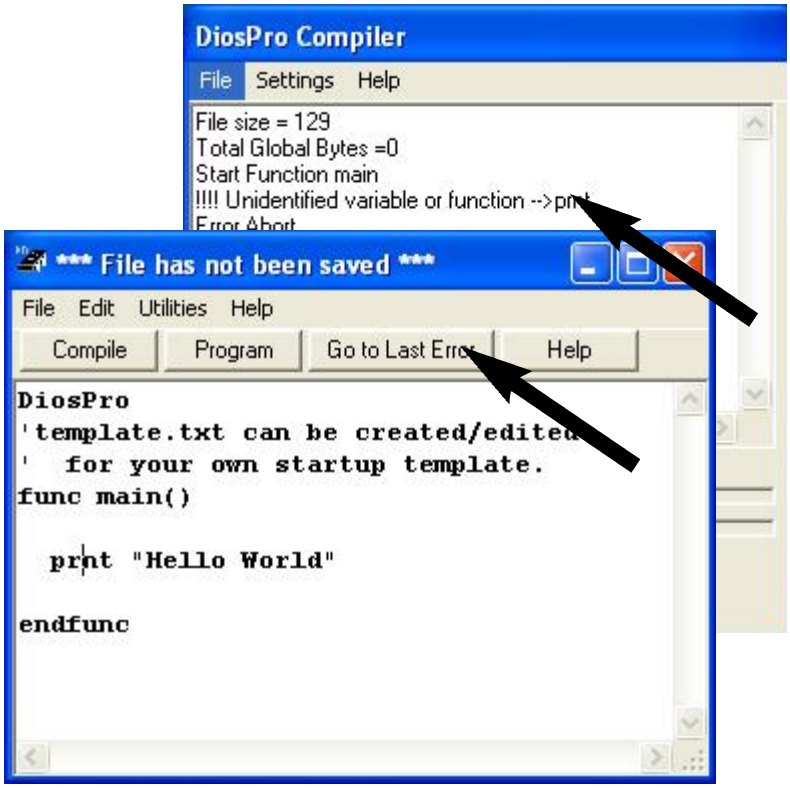


Figure 1.24: Compiler Error

The cursor will jump to the location in the file where the error was encountered

Note If the error is in an include file the cursor will jump to the include file definition. Double click this definition and the Include file will open. Click the **Go to Last Error** in that file and the cursor will jump to the error in that file.

Debug Terminal

Any time you use the debug or print commands the software will activate the debug termina The debug terminal is set to 115200 baud. This is the baud rate used to communicate with the Dios Ultra and the DLC programmed chips.

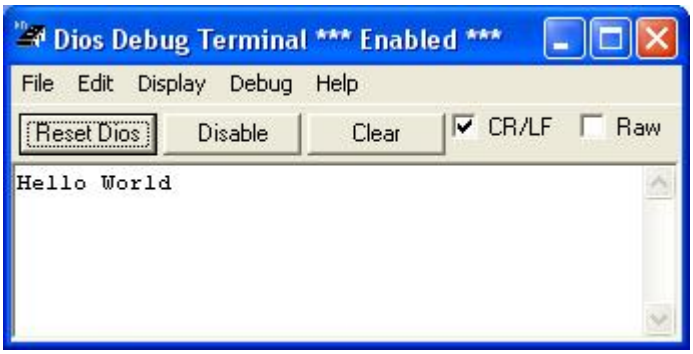


Figure 1.25: Debug Terminal

By default, any character with a ASCII value less than 32 will be placed in <> and displayed as such. If you wish, you can force all characters to be displayed in raw format by selecting the raw check box.

You can disable the terminal by clicking the disable check box. Note that the display field can only hold about 20,000 characters, so it is automatically trimmed. By disabling the terminal it freezes the display.

Debug and Interrupts

The timing used to generate debug and print commands are very precise and an interrupt operating in the background can sometimes throw this timing off. Many other microcontrollers don't suffer from this anomaly because they don't support true interrupts like the Dios does. In order to work around this issue check out the interrupts section.

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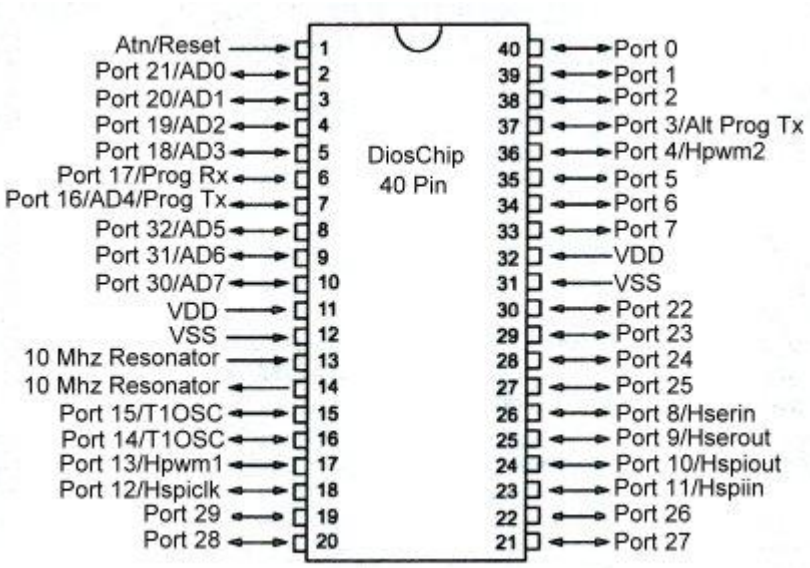
Introduction

There are currently 6 hardware form factors. Don’t worry, the language is exactly the same for all of them. It is simply a matter of what features and the number of IO ports that are made available.



Form Factor: .6 x 40 Pins

IO Ports: 33

Analog to Digital Lines: 8

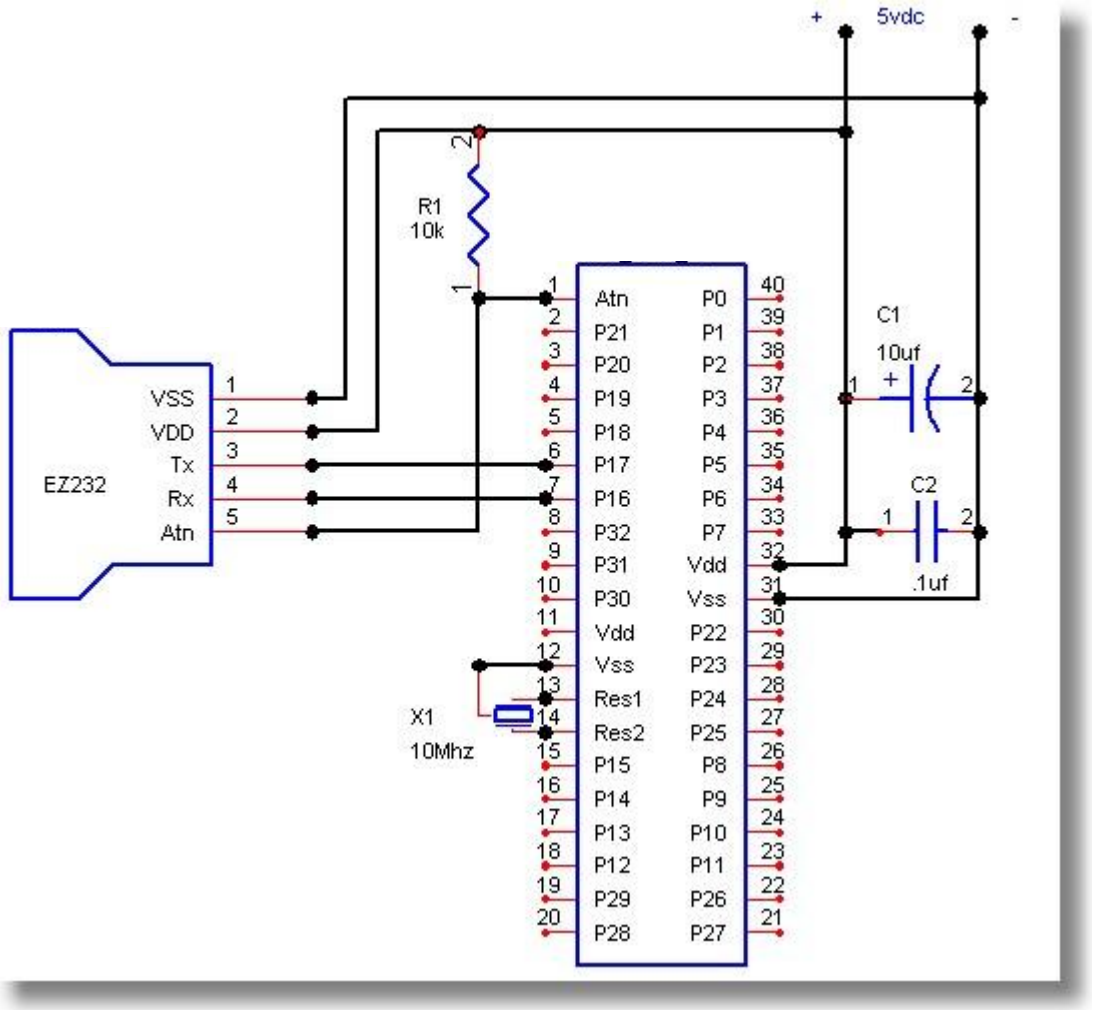
Program memory: 16/16K

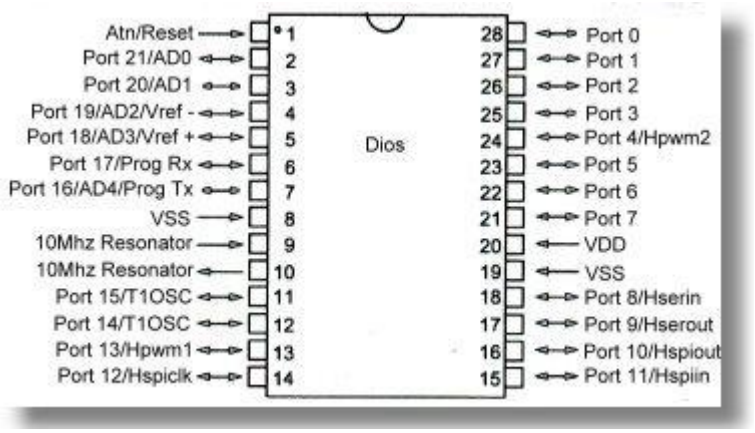
Power Source: 3-5.5v DC

EZRS232 Driver required. Check Appendix G to build your own.

Required Componets:

- 10Mhz Resonator
- 10k Resistor
- 10uf Capacitor
- .1uf Capacitor





Form Factor: .3 x 28 Pins

IO Ports: 22

Analog to Digital Lines: 5

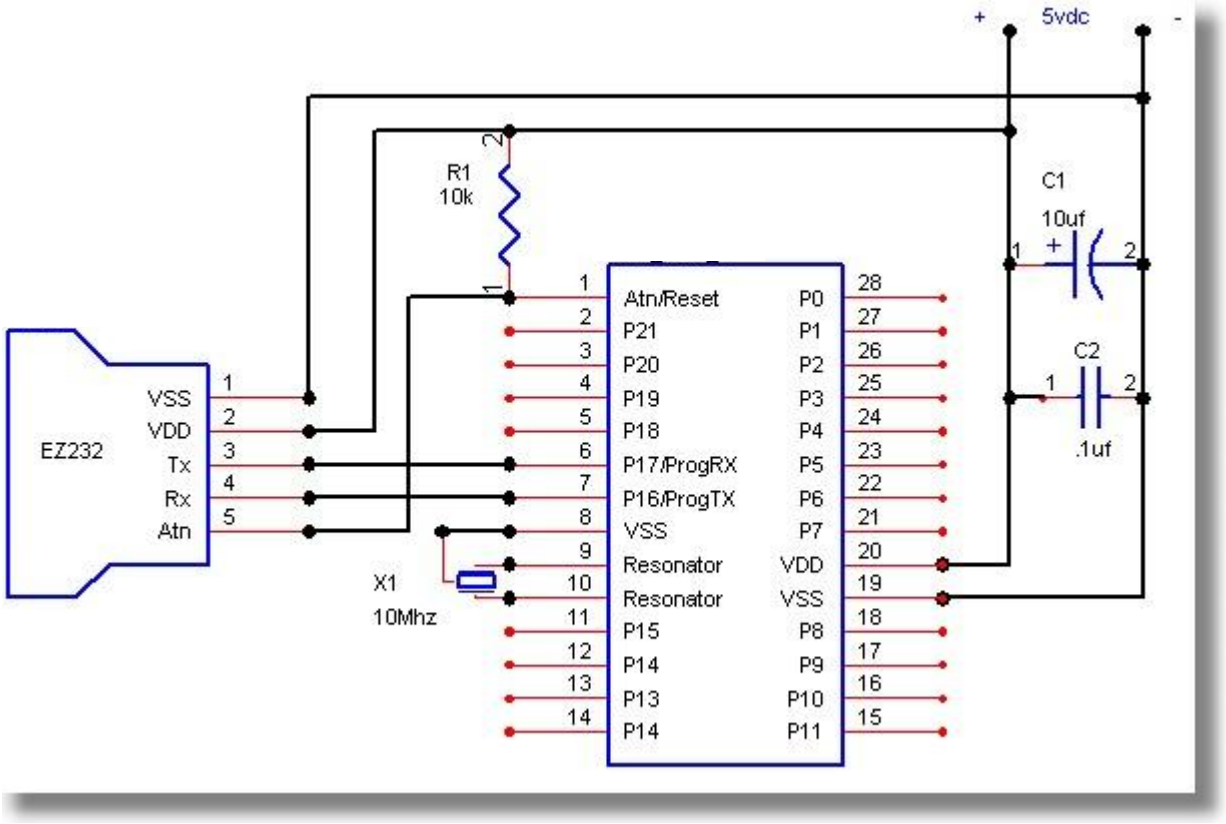
Program memory: 16/16K

Power Source: 3-5.5v DC

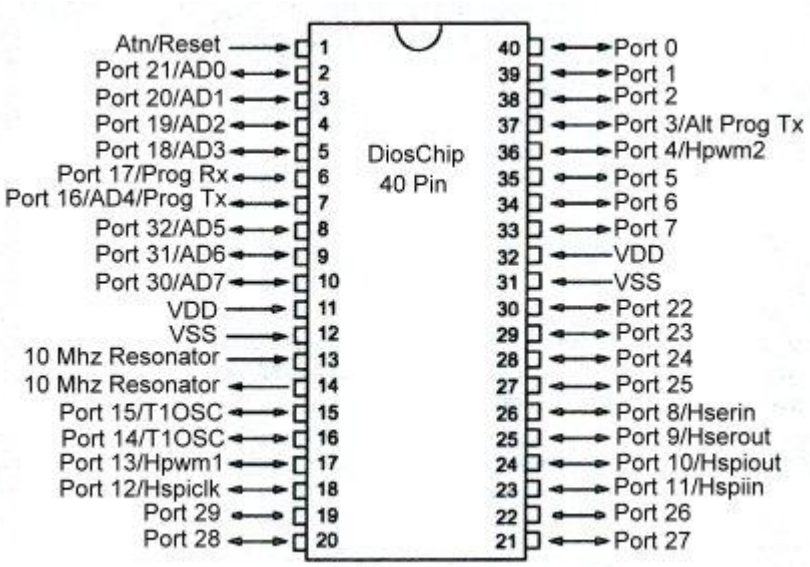
EZ RS232 Driver required. Check Appendix G to build your own.

Required Componets:

- 10Mhz Resonator
- 10k Resistor
- 10uf Capacitor
- .1uf Capacitor



DiosPro Hookup



Form Factor: .6 x 40 Pins

IO Ports: 33

Analog to Digital Lines: 13

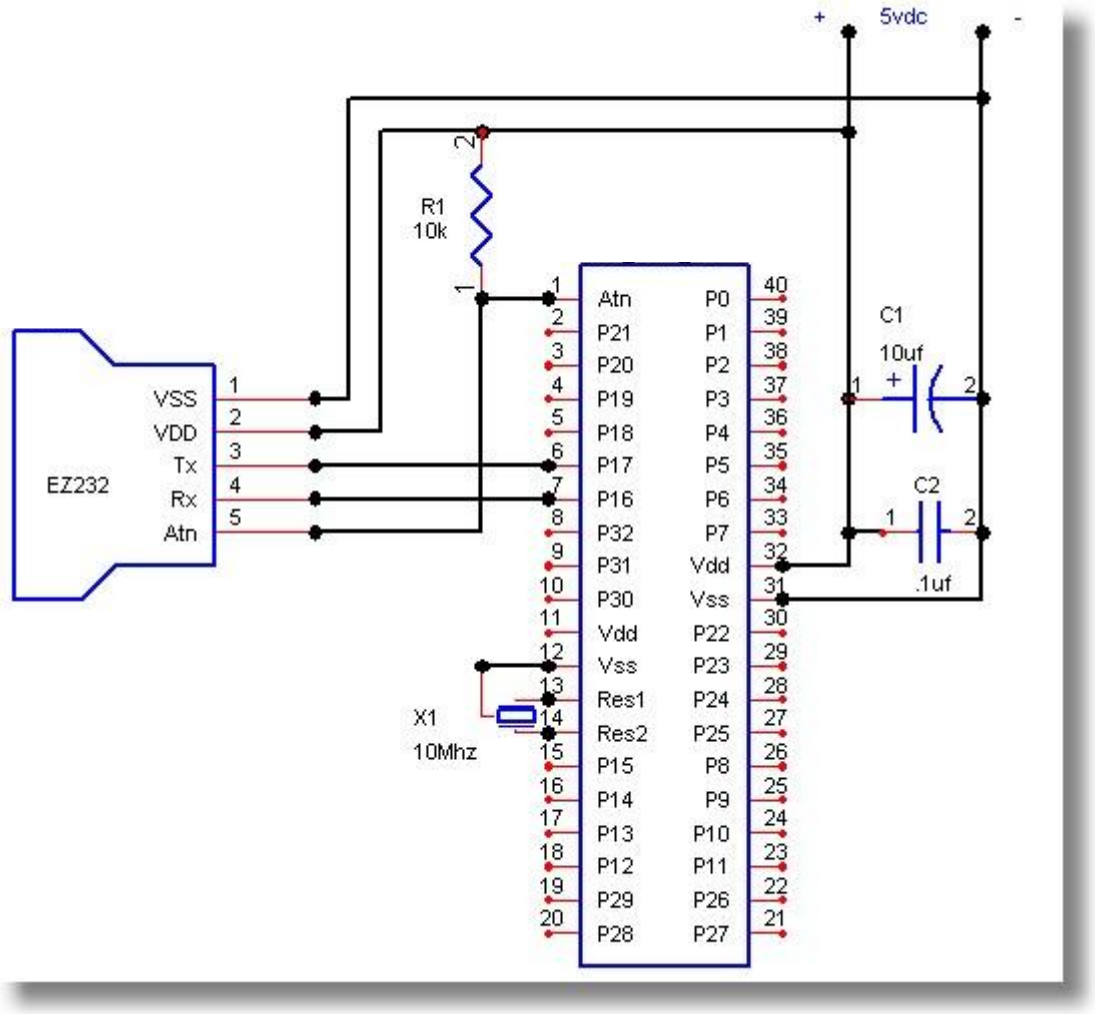
Program Memory: 16/48K

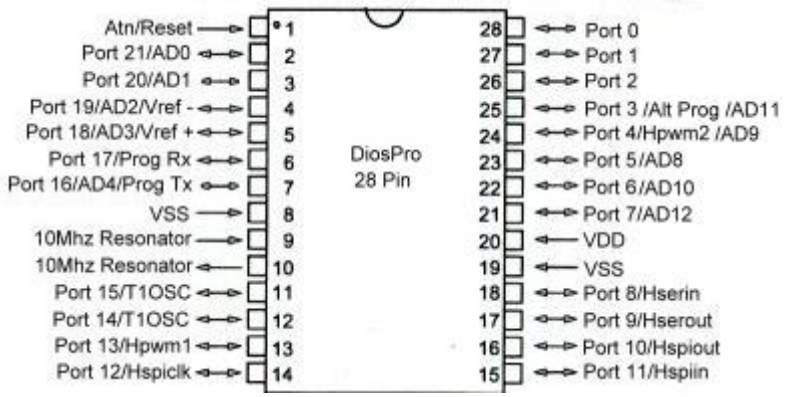
Power Source: 2.5-5.5v DC

EZRS232 Driver required. Check Appendix G to build your own.

Required Componets:

- 10Mhz Resonator
- 10k Resistor
- 10uf Capacitor
- .1uf Capacitor





Form Factor: .3 x 28 Pins

IO Ports: 22

Analog to Digital Lines: 10

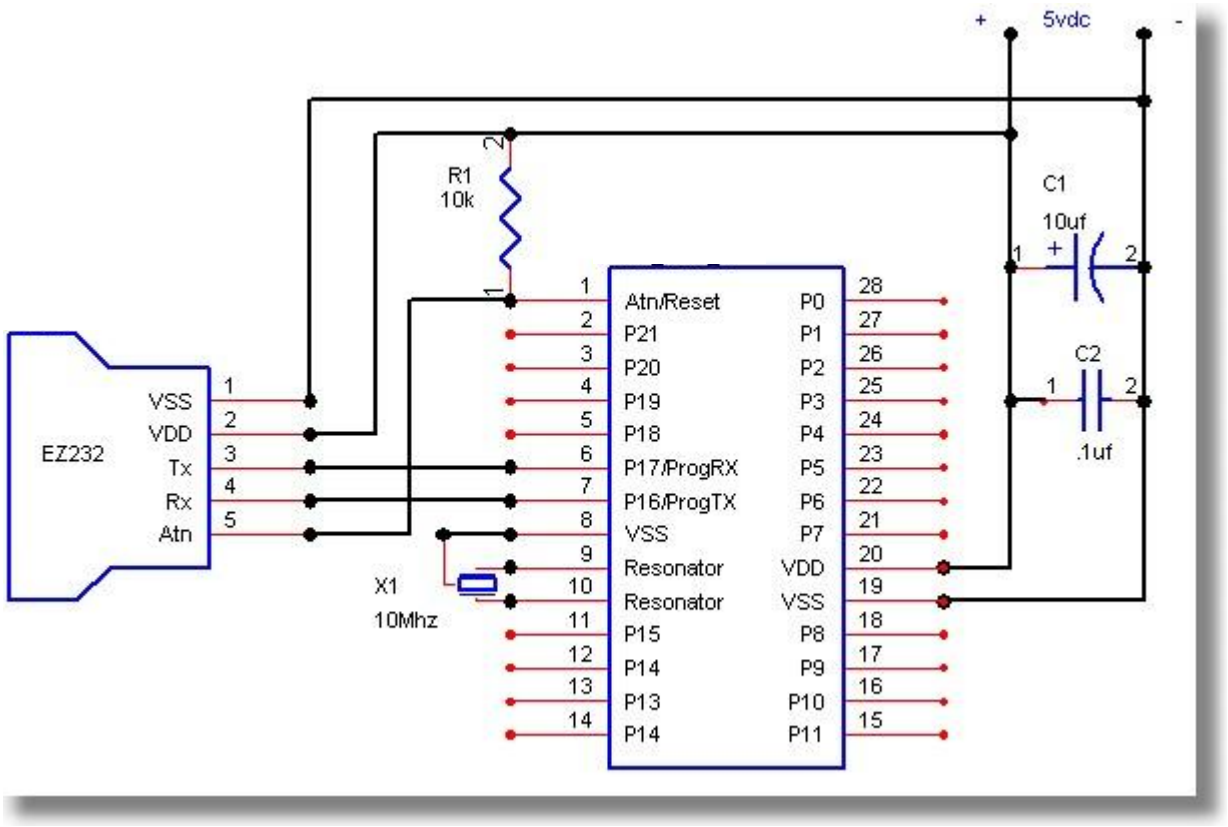
Program memory: 16/48K

Power Source: 3-5.5v DC

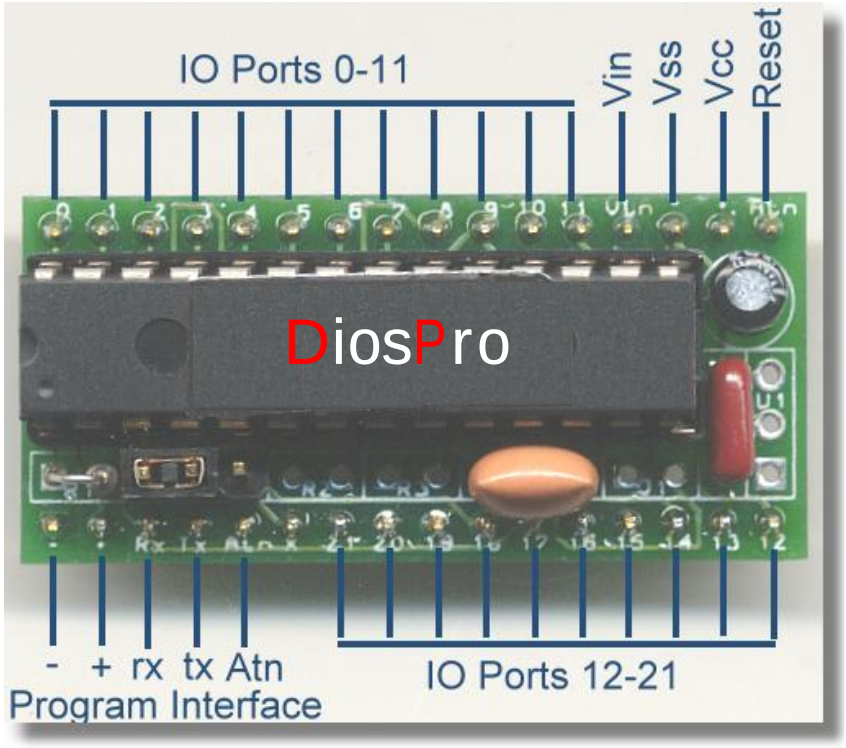
EZ RS232 Driver required. Check Appendix G to build your own.

Required Componets:

- 10Mhz Resonator
- 10k Resistor
- 10uf Capacitor
- .1uf Capacitor



The Dios Chip **is not** included with the Carrier. They are sold seperatly.



Form Factor: .6 x 32 Pins

Chip Used: Dios 28 Pin Chip

IO Ports: 22

Analog to Digital Lines: 5

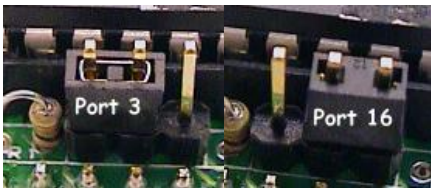
Power Source: 2.5-5.5v DC

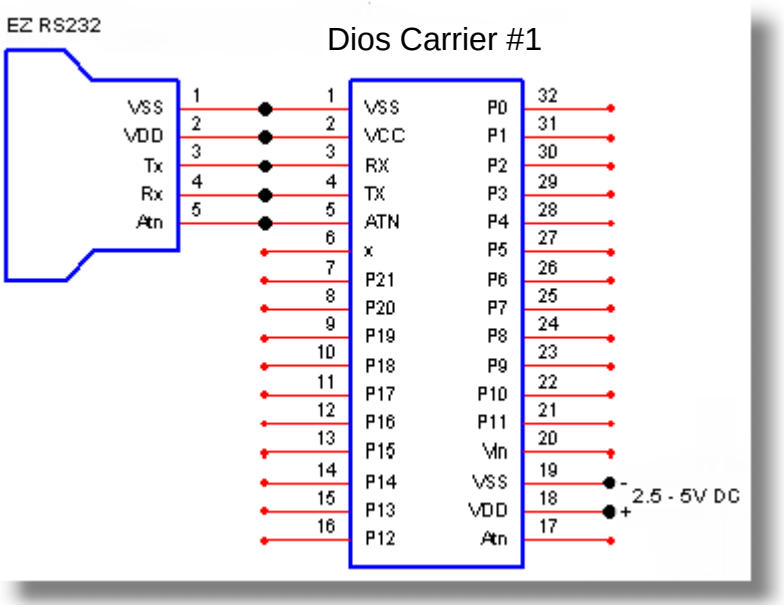
EZ RS232 Driver required. Check Appendix G to build your own.

Required Componets:
None

Options:
5V Regulator

You can set the transmit program lead by changing the jumper as shown. Remember you also must set the port in the software as well.





The Dios Chip **is not** included with the Carrier. They are sold seperatly.

The Dios Carrier #2 was designed to run as a coprocessor. There are libraries for both master and slave devices included with the Dios software.

Form Factor: 2-5/8" x 1-7/16" board

Chip Used: Dios 28 Pin Chip

IO Ports: 22

Analog to Digital Lines: 5

Power Source: 2.5-5.5v DC / 7 - 14v with Regulator Option

EZ RS232 Driver required. Check Appendix G to build your own.

Required Componets:
None

Options:
Regulator, External Timer Clock

Connecting the Dios Carrier #2 board to the PC

There are 2 RS232 Drivers available from Kronos Robotics. If you wish to build your own see Appendix A.

Both the EZ232 and EZ232B drivers are available on the Kronos Robotics web site. See them at:

http://www.kronosrobotics.com/detail.asp?product_id=EZ232
and
http://www.kronosrobotics.com/detail.asp?product_id=EZ232B

To use one of the EZ drivers, plug it into the program port as shown in figure 8.

EZ232 EZ232B

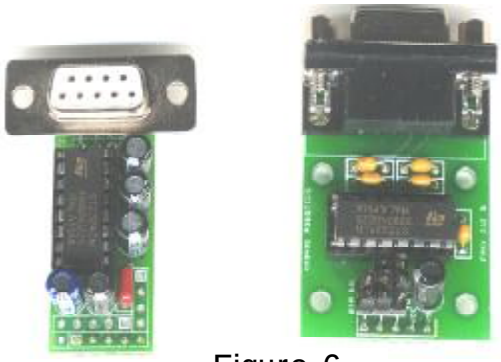
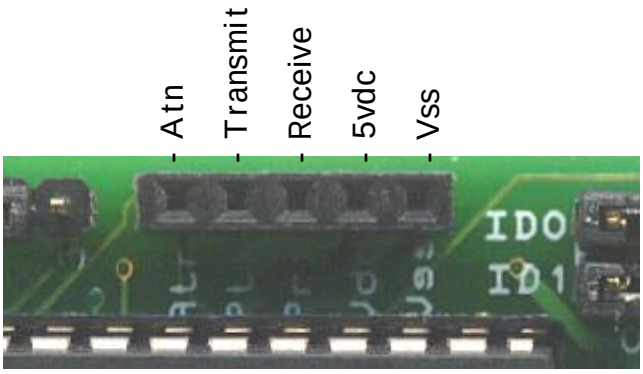


Figure 6

If you build your own driver use connections shown in figure 7.



Program Port

Figure 7

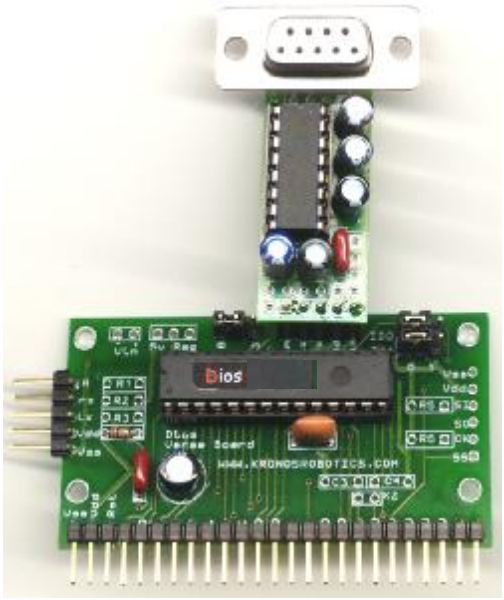


Figure 8

Notes

You will need a level converter chip. I recommend the ST232ACN as it will work at speeds up to 250K baud and will accept .1 uf or 1uf capacitors.

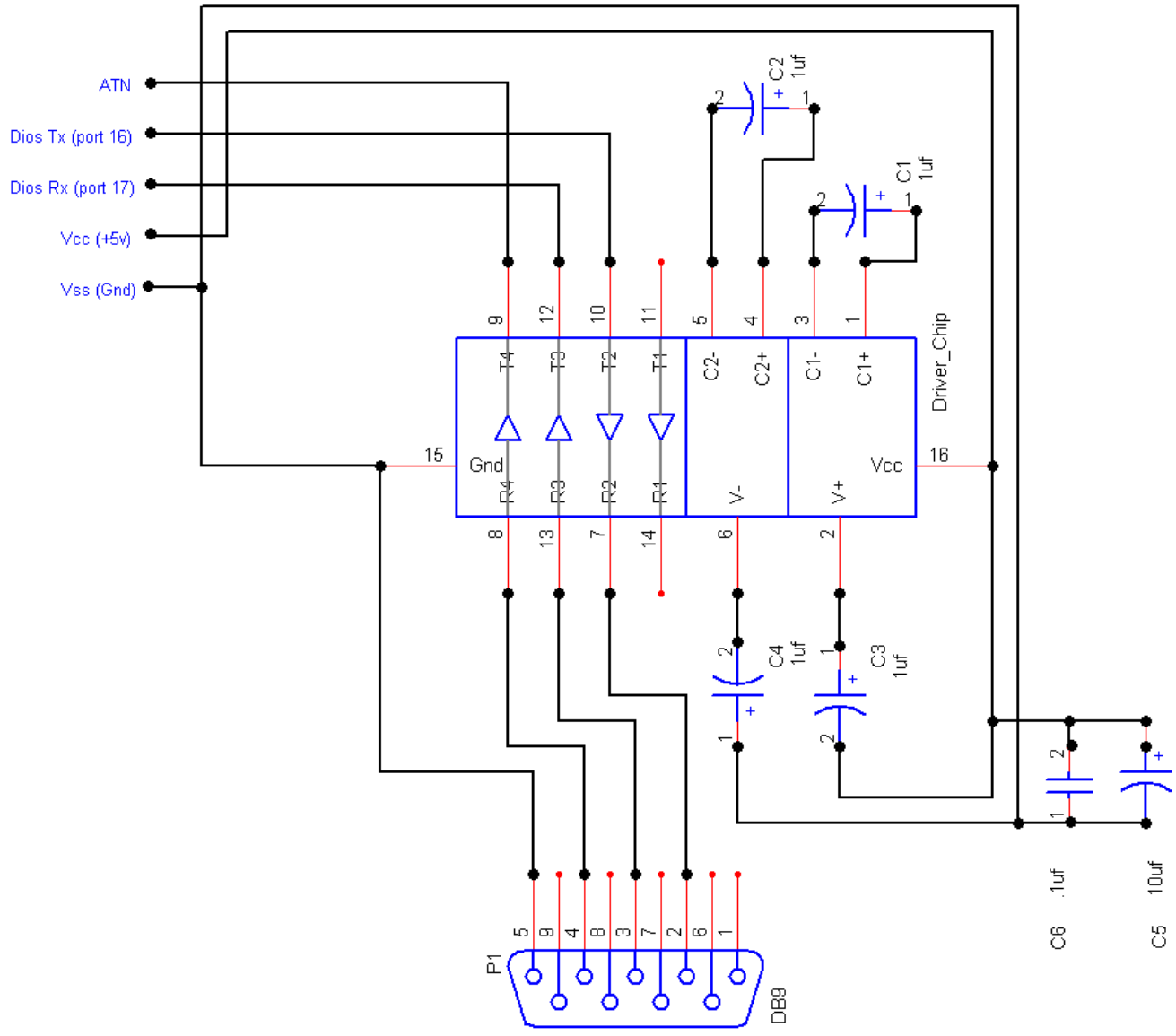
The Kronos Robotics Part number for this chip is MAX1 and can be purchased at
http://www.kronosrobotics.com/detail.asp?product_id=MAX1

With the ST232ACN you can use ether .1 or 1 uf capacitors for C1-C4.

Note that the Dios Transmit port can be IO port 16 or port 3. On the Dios Carrier 1 and Carrier 2 boards this is jumper selectable. You must set it up via the Dios Software.

Dios Carrier 1 and Dios Carrier 2 Port Pins

- Dios Tx Port 16 = Pin 4
- Dios Rx Port 17 = Pin 3
- Dios Atn = Pin 5



Reserved Words

This is a list of reserved words used by the DiosPro Engine. They are used for commands, functions, registers and variables. Do not use them for your own commands, functions, labels, constants or variables. If you do then expect unpredictable results.

Note that is some cases the ... is used. This represents a wild card. For example irqINT0... means don't create any variable or function starting with irqINT0. These are reserved for future use.

ACUMEH
ACUMEL
ADCON0
ADCON1
address
addressreadi
addressreadf
addresswritei
addresswritrf
ADRESH
ADRESL
arrayget
arrayset
ASMDAT...
AtoDinit
AtoDinitlj
and
auto
bintodec
bit
BITCOUNTER
BITDATA
branch
break
BSR
BSR_TEMP
Button
BUTTONFLAG1
BUTTONFLAG2
BUTTONFLAG3
Buttoninit
byte
BYTE...
CCP1CON
CCP2CON
CCPR1H
CCPR1L
CCPR2H
CCPR2L
CelsiustoF
clear
clk165
clk595
CMDSTAT
COUNTER
COUNTERH
CPcidx
CPCMD
CPdat01
CPdat23
CPdat45
CPdat67
CPdat89
CPgetstatus
CPhigh
CPinit
CPinput
CPio...
CPlen
CPloaddefaults
CPlow
CPMotor...
CPoff
CPon
CPoutput
CPreadEEprom
CPrxcount
CPrxset
CPsend
CPsendbytes
CPServo...
CPslave
CPslaveinit
CPstat
CPtxcount
CPtxoff
CPtxset
CPTYPE_ID
CPver
CPversion
CPwriteEEprom
CUSTOMBIT...
CUSTOMMASK
customportget
customportset
dat165
dat595
data
debug
DEBUGPADH
DEBUGPADL
DEBUGTX
dec
decmask
DELAYCOUNT2H
DELAYCOUNT2L
DELAYCOUNTH
DELAYCOUNTL
dim
DIOSFLAGS1
DS1302CLK
DS1302getbyte
DS1302getdate
DS1302getday
DS1302gethour
DS1302getmin
DS1302getmonth
DS1302getram
DS1302getrawbyte
DS1302getsec
DS1302getyear
DS1302init
DS1302IO
DS1302RST
DS1302sendbyte
DS1302sendreg
DS1302setcharger
DS1302setdate
DS1302setday
DS1302sethour
DS1302setmin
DS1302setmonth
DS1302setram
DS1302setsec
DS1302setyear
DS1620H
DS1620init
DS1620NEG
DS1620readtemp
DS1820quicktemp
DS1820readtemp
EADDRESS
EEADR
EECON1
EECON2
EEDATA
eeread
eewrite
else
end
endasm
endasmcommand
endfunc
endfunction
endif
endirq
endirqasm
endsub
exit
exitirq
for
FSR0H
FSR0L
FSR1H
FSR1L
FSR2H
FSR2L
func
function
floatmask
FLOATMASK1
FLOATMASK2
G_LCDE
G_LCDRS
G_LCDRW
G_P0
G_P1
G_P2
G_P3
getbyte
getstringbyte
global
gosub
HC165init
HC165read
HC165readx2
HC595high
HC595init
HC595low
HC595write
HC595writem
high
hserfloat
hserin
hserout
HSERPADH
HSERPADL
hsersetup
HSERWH
HSERWL
I2c_getack
I2c_getbyte
I2c_sendack
I2c_sendbyte
I2c_sendnack
I2c_start
I2c_stop
I2cin
I2cin2
I2cout
I2cout2
I2creadfloat
I2creadint
I2creadstring
I2cwritefloat
I2cwriteint
I2cwritestring
if
inc
include
INDF
INDF0
INDF2
INPIN
input
integer
int
INTCON
INTCON
INTCON2
ioport
IPR1
IPR2
IRcmd
IRdevice
IRkeypad
irqfunc
IRinitsend
irqINT0...
irqINT1...
irqINT2...
irqLVD...
irqPSP...
irqRB...
irqSSP...
irqTMR0...
irqTMR1...
irqTMR2...
irqTMR3...
irqtx...
irqCCP1...
irqCCP2...
irqAD...
irqperipheralstart
irqperipheralstop
irqglobalstart
irqglobalstop
IRread
IRreadverify
IRsendcode
KBCLKpin
KBflags
KBflags
KBgetASCII
KBinit
KBIOpin
KBLEDupdate
KBread
KBreadraw
KBsendraw
lat595
LATA
LATB
LATC
LATD
LATE
LCDchar
LCDcharxy
LCDchkport
LCDcls
LCDcontrol
LCDgoto
lcdinit
LCDloadchar
LCDmegamenu
LCDmenu
LCDraw
LCDrawxy
LCDread
LCDtext
lcdwrite
lcdgoto
lcdcontrol
lcdchar
load165
lookdown
lookdownmode
lookup
low
LVDCON
LVDinit
LVDread
MAX522CLK
MAX522CS
MAX522DATA
MAX522init
MAX522set1
MAX522set2
MCPset
MCPshutdown
mem...read
mem...write
next
nop
odhigh
odlow
onirq
OPP1
OPP10H
OPP10L
OPP2
OPP3
OPP4
OPP5
OPP6
OPP7
OPP8
OPP9H
OPP9L
or
OSCCON
output
OWloadaddr
OWprintaddr
OWread
OWreadbyte
OWreadrom
OWreset
OWsendbyte
OWwrite0
OWwrite1
pause
pauseus
PCL
PCLATH
PCLATHU
PIE1
PIE2
PIR1
PIR2
PLUSW0
PLUSW1
PLUSW2
port595
PORTA
PORTB
PORTC
PORTD
PORTE
portget
PORTMASK
portset
POSTDEC0
POSTDEC1
POSTDEC2
POSTINC0
POSTINC1
POSTINC2
PR2
PREINC0
PREINC1
PREINC2
print
printfloat
PRODH
PRODL
PROGADDRH
PROGADDRL
PROGLENH
PROGLENL
pullupoff
pullupon
pulsein
pulseout
PWM1duty
PWM2duty
PWMcourse
PWMinit
PWMperiod
random
randomize
RCON
RCREG
RCSTA
RECFLG
return
RISA
RISB
round
RSkeypadinit
RSkeypadread
RXDAT
RXHEAD
RXTAIL
SBBRG
serfloat
serin
serout
SERPADH
SERPADL
sersetup
setfloatmask
setdecmask
SERVO1
SERVO1
SERVO2
SERVO2
SERVO3
SERVO3
SERVO4
SERVO4
SERVOCOUNT
SERVOCOUNTER
SERVOinit
SERVOMAX
SERVOMAXCOUNTER
SERVORESET
SERWH
SERWL
shiftin
sleep
SOFTBAUDH
SOFTBAUDH
SOFTSTAT
SOFTWAITH
SOFTWAITL
sonar
SSPADD
SSPBUF
SSPCON1
SSPCON2
SSPSTAT
STACK1IDX
STACK2IDX
STACKTMP
startasm
startasmcommand
startirqasm
STATUS
STATUS_TEMP
STKPTR
step
STRgetword
STRgetwrodaddr
STRinstr
STRlen
STRprinttext
STRval
strout
string
sub
swapbyte
swapnib
T0CON
T1CON
T2CON
T3CON
TABLAT
table
TACUMEH
TACUMEL
TBLPTRH
TBLPTRL
TBLPTRU
then
TMP
TMP2
TMR0H
TMR0L
TMR1H
TMR1L
TMR2
TMR3H
TMR3L
toggle
TONE
TONEfreqout
TONEnote
TOSH
TOSL
TOSU
TRISC
TRISD
TRISE
trunc
TXREG
TXSTA
VARBIDX
VARBSAVEH
VARBSAVEL
VERSION
W_TEMP
waitport
watchdogon
watchdogoff
WDTCON
wend
while
word
WREG
XHI
XLO
YHI
YLO

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
00	00	NUL	32	20	SP	64	40	@	96	60	`
01	01	SOH	33	21	!	65	41	A	97	61	a
02	02	STX	34	22	"	66	42	B	98	62	b
03	03	ETX	35	23	#	67	43	C	99	63	c
04	04	EOT	36	24	$	68	44	D	100	64	d
05	05	ENQ	37	25	%	69	45	E	101	65	e
06	06	ACK	38	26	&	70	46	F	102	66	f
07	07	BEL	39	27	ë	71	47	G	103	67	g
08	08	BS	40	28	(	72	48	H	104	68	h
09	09	HT	41	29	)	73	49	I	105	69	i
10	0A	LF	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	44	2C	'	76	4C	L	108	6C	l
13	0D	CR	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	48	30	0	80	50	P	112	70	p
17	11	XON	49	31	1	81	51	Q	113	71	q
18	12	DC2	50	32	2	82	52	R	114	72	r
19	13	XOFF	51	33	3	83	53	S	115	73	s
20	14	DC4	52	34	4	84	54	T	116	74	t
21	15	NAK	53	35	5	85	55	U	117	75	u
22	16	SYN	54	36	6	86	56	V	118	76	v
23	17	ETB	55	37	7	87	57	W	119	77	w
24	18	CAN	56	38	8	88	58	X	120	78	x
25	19	EM	57	39	9	89	59	Y	121	79	y
26	1A	SUB	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	62	3E	>	94	5E	à	126	7E	~
31	1F	US	63	3F	?	95	5F	_	127	7F	DEL