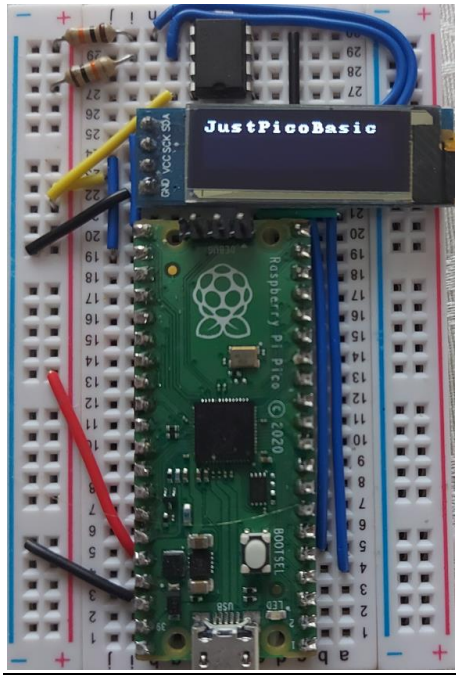
#JustPicoBasic manual

The best way to see how it works is to run a few examples: https://github.com/bgolab/JustBasic/tree/main/examples

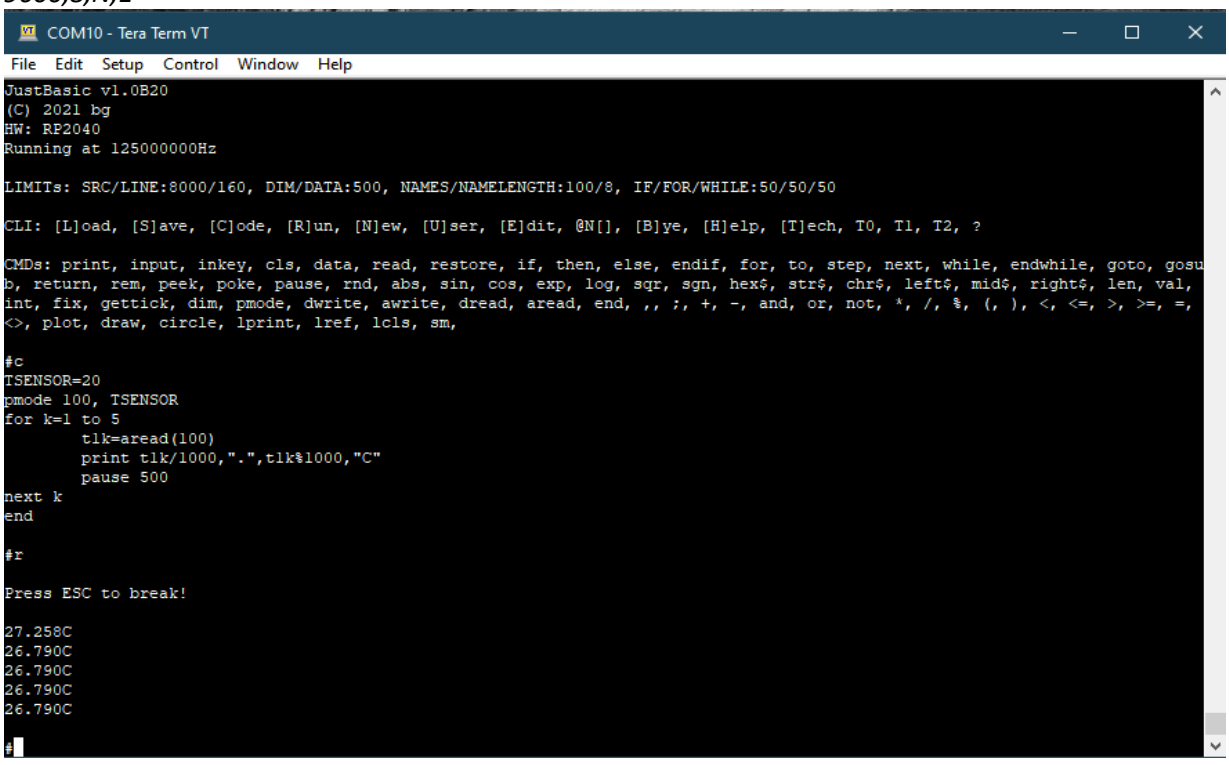
Wiring

Hardware components: RPI PICO, OLED 0.91" I2C, EEPROM 24c64 I2C, 2x resistors 10kohm



Terminal emulator

JustPicoBasic was tested w/ Putty and TeraTerm. Copy & Paste is supported.
Settings: 9600,8,N,1



Code formatting

You can freely format the code – can put many commands in single line, etc. Capital and small letters accepted for keyword (i.e. 'CLS' and 'cls' are the same). Names recognizes small and capital letters (i.e. 'as' is different than 'AS')

Get started

Power the PICO through the USB. Start the terminal emulator.
Drag & Drop the current UF2 file (e.g. JustBasic-1.0b30.uf2). The JustPicoBasic will boot.
*Enter '**?**' (the question mark) and press ENTER. You will see available commands (CLI & BASIC commands).*
Enter the following program:

```
pmode 25,1
for k=1 to 5
dwrite 25,1
pause 500
dwrite 25,0
pause 500
next k
end
```

*Then enter '**c**' to see the code. Use '**r**' to run the code. The built-in LED will blink a couple of times.*
*'**n**' clears the program memory. You can use **@N** to delete Nth line or **@N <code>** to insert the line of code.*

Program structure

Program Structure	***Description/Comments***	***Example***
code *gosub subroutines1* *end* *subroutines1:* *[subroutine1 code]* *return*	*Command 'end' has to follow the last line of the main code. Subroutines have to follow the 'end'.*	*print "Hi!"* *gosub callme* *end* *callme:* *print "Hi!"* *return*

System commands

Command	***Description/Comments***	***Example***
ESC key	*Break the program while Running or prevent from Loading.*	
?	*Shows info about the VM (ver, available commands)*	
c	*Show code ('SM LN 0' prevents from displaying line numbers)*	
r *r <code>*	*Run – run code from SRAM memory* *Run - run single line of code NOT stored in memory (ad-hoc)*	*r n=2 data 2, 3 s=0 for i=1 to n read a s=s+a next i print "s=", s end*
n	*New – clear VM memory and code*	
b	*Bye: PICO – reboot VM in disk mode, Windows - exist*	
l *s*	*l - Load program from EEPROM (auto.bas)* *s - Save program to EEPROM (auto.bas)*	
ee *ed*	*ee - EEPROM erase – to decide if required, now disabled* *ed - EEPROM dump – show EEPROM content*	
is	*I2C scan – show I2C devices on both I2C buses*	
t0|t1|t2	***Program Flow Tracing**:* *t0 - Disable Tracing; t1 - Stepping Mode; t2 - Run with Tracing*	*T1|T2 - enable particular tracing mode* *R – run program in T1 or T2 mode*
@N *@N <code>*	***Pico Editor.** Normally new code is appended at the end;* *@N delete Nth line; @N <code> insert <code> before Nth line*	*@3 – removes 3rd line of code* *@4 CLS – inserts 'CLS' before line 4*

The language

MISC

Command	***Description/Comments***	***Example***
SM <entity> 1|0	*System Mode command for system entities configuration. Entities:* *ESC (default=enabled) – enable / disable ESC key check (disable to boost perf)*	*SM ESC 0* *SM OLED 1*

	OLED (default=disabled) – enable OLED hw (cannot be disabled now) LN (default=enabled) – enable / disable line numbering for 'c' command	SM LN 0
REM	Comment	REM MyProc
CLS	Clear Screen	

VARIABLES *(STRING arrays NOT supported yet)*

-variable name: up to 8chars letter&digits starting w/ a letter(digits, '#", '$', '_', ':' accepted)

*-expr: combination of INT/FLOAT and ops/brackets(+, -, *, /, %,(,)) and INT/FLOAT vars;*

-sexpr: combination of string, string functions (with suffix $) and string vars (with suffix $) and '+' op

Command	Description/Comments	Example
var=expr	INT var (no suffix), name=expr, 1st-reference creates var(value=0);	sy=2*abs(-15) + a*20
var#=expr	FLOAT var (# suffix), name#=expr, 1st-reference creates var(value=0);	w#= a#-2*(2+3)+abs(-1.0)
var$=sexpr	STR var ($ suffix), name$=sexpr	v$="a"+a$+left$(str$(13),1);
DIM var(n)=expr	INT array, 1-dimension, DIM name(size); name(item)=expr	DIM a(3) a(0)=3
DIM var#(n)=expr	FLOAT array, 1-dimension, DIM name#(size); name#(item)=expr	DIM(b#(3) b#(0)=2.5

PROGRAM FLOW CONTROL

Command	Description/Comments	Example
FOR var=expr TO expr [STEP expr] [] NEXT var	if STEP[default=1] is negative var decreases; FLOAT supported; nesting supported	FOR i = 5 TO 1 STEP -1 NEXT I END
WHILE condition [code] ENDWHILE	FLOAT supported; nesting supported; AND/OR/NOT supported;	a=0 while a<5 print a a=a+1 endwhile end
IF condition THEN [code] [ELSE] [code] ENDIF	FLOAT supported; nesting supported AND/OR/NOT) supported;	if a>1 and b#>3.4 then print "ok" else print "bad" endif
label: GOTO label	label name starting with a letter, terminated by colon; up to 8 letter & digits(plus '_'); can be located(before or after GOTO)	k=1 again: print k k=k+1 if k<5 then goto again: endif
GOSUB label label: [code] RETURN	label can be located after END	gosub task0 end task0: print "done" return
RETURN		
END	last instruction (GOSUB labels MUST be located behind the END)	

INPUT, OUTPUT, DATA

Command	Description/Comments	Example
PRINT expr[, sexpr], [;]	Prints expr, sexpr separated by ','; ';' to skip NEW LINE	PRINT "6/3=", 6/3 (with NEW LINE) PRINT 1; (w/o NEW LINE because of ';')
INPUT var, …	Assign int/float/str values to (array) var	INPUT a(2), d#, name$ print a(2), d#, name$
DATA expr, sexpr;	INT/FLOAT/STR supported	DATA 1.5, 2*a
READ a, b#, d$	Assign DATA specified input to vars	READ v, v#, v(), v#();
RESTORE reset data pointer		

BUILT-IN FUNCTIONS

Command	Description/Comments	Example
LEFT$$(sexpr), RIGHT$$(sexpr), MID$(sexpr), LEN(sexpr), VAL(sexpr)	Left$/right$/mid$ - trimming functions, len - string length, Val – converts string to value	k$=LEFT$("abcdefgh", 3) + "1234" PRINT VAL("-1234")+1 i=1234567 i$=MID$(STR$(i), 2, 3) PRINT i$
HEX$(expr), STR$(expr), CHR$(expr)	Hex$ – expr to hex string, Str$ - expr to string, Chr$ - expr to ascii	PRINT HEX$(NOT(0x0F)) a=65 d$=chr$(a)
SIN(expr), COS(expr), SQR(expr), EXP(expr), LOG(expr), SGN(expr), ABS(expr)	Math functions	PRINT "SQR:", SQR(5), "EXP:", EXP(1), "LOG:", LOG(2.718), "SIN:",SIN(3.14/6),"COS:",COS(3.14/3)

RND(max)	Hw-based random generator with von Neuman extractor-whitenizer	PRINT "RND: ", RND(1000)
GETTICK()	Tick number	a=gettick()
PAUSE msec	Delay (blocking) in msec	PAUSE 2*500
INKEY()	Current key (pressed), otherwise 0; non-blocking (no-wating)	
INT/FIX(expr)	QBASIC like	a=INT(1.1) b=INT(-1.1) c=FIX(1.9) d=FIX(-1.9) PRINT a, ", ", b, ", ", c, ", ", d (1, -2, 1, -1)
AND(expr,expr), OR(expr,expr), NOT(expr)		PRINT AND(0x03,0x0F) PRINT OR(0x01,0x02) PRINT HEX$(NOT(0x0F))

PICO HARDWARE SUPPORT

Command	**Description/Comments**	**Example**

PEEK(addr)
POKE addr, value
	Memory read / write; hex supported	REM SYSTICK
		SYSTCSR=0xe000e010
		SYSTRVR=0xe000e014
		SYSTCVR=0xe000e018
		poke SYSTCSR, 0
		poke SYSTRVR, 0x1e847
		poke SYSTCSR, 5
		for k=1 to 50
		  print and(peek(SYSTCVR), 0x00FFFFFF)
		  pause 1000
		next k

PMODE pin, mode	mode: 0-IN, 1-OUT, 2-PULLUP, 3-PULLDOWN, 10-ADC, 15-PWM, 20-TSENSOR	
AREAD(pin)	Read analog pin; pins=26-29 – analog pin; pin=100 –temperature virtual pin	pmode 26, 10 voltage=aread(26) pmode 100, 20 temp= aread(100)
AWRITE pin, cycles	PWM duty=cycles/65535 cycle: 0-65535)	pmode 22, 15 awrite 22, 16000
DREAD(pin)	Read digital pin	REM explorer buttons: a, b, x, y a=12 b=13 x=14 y=15 pmode y, 0 pmode y, 2 for k=1 to 2 step 0 pause 50 print dread(y) next k
DWRITE pin, value	Write digital pin	REM explorer led - pin 25 pmode 25, 1 dwrite 25,1 pause 3000 dwrite 25,0

GRAPHIC LCD/OLED SUPPORT *(currently: OLED0.91 support)*

Command	**Description/Comments**	**Example**
SM OLED 1	Enable OLED support	
LPLOT X, Y	Draw point at X, Y	for x=0 to 127 lplot x,fix(15+15*sin(2*3.14159*x/128)) next x lref
LDRAW X, Y	Draw line from the last PLOT / DRAW X, Y	plot 10,10 ldraw 20,20 lref
LCIRCLE x, y, r	Draw circle at x, y, r	lcircle 15, 15, 10
LPRINT expr, sexpr [AT x, y]	Prints expr, sexpr separated by ‘,’; optional AT x, y (default 0,0)	lprint “2+2=”, 2+2 AT 10,10 lref
LCLS	Clear Screen	lcls
LREF	Refresh LCD (copy mem content to LCD)	lref