

VIC 20 / Commodore 64 RS 232

OPEN LF, 2, SA, CHR\$((7 6 5 4 3 2 1 0)) + CHR\$((7 6 5 4 3 2 1 0))

RS 232 User Port Lines



VIC 20 RS 232 is controlled by VIA 1 (6522) at \$9110
C64 RS 232 is controlled by CIA 2 (6526) at \$DD00

Pin#	Chip	Description	Abrv	Dir.	Modes
A	GND	Protective Ground	GND		1 2
B	FLAG2	Received Data	S _{in}	IN	1 2
C	PB0	Received Data	S _{in}	IN	1 2
D	PB1	Request to Send	RTS	OUT	1* 2
E	PB2	Data Terminal Ready	DTR	OUT	1* 2
F	PB3	Ring Indicator	RI	IN	3
H	PB4	Received line Signal	DCD	IN	2
J	PB5	Unassigned		IN	3
K	PB6	Clear To Send	CTS	IN	2
L	PB7	Data Set Ready	DSR	IN	2
M	PA2	Transmitted Data	S _{out}	OUT	1 2
N	GND	Signal Ground	GND		1 2 3

Available Modes

- 1) 3-Line interface (S_{in}, S_{out}, GND)
 - 2) X-Line interface
 - 3) User available only (unused in code)
- * these lines are held high during 3-line mode.

Control Register

Baud	7	6	5	4	3	2	1	0
User*	0	0	0	0				
50	0	0	0	1				
75	0	0	1	0				
110	0	0	1	1				
134.5	0	1	0	0				
150	0	1	0	1				
300	0	1	1	0				
600	0	1	1	1				
1200	1	0	0	0				
2400	1	0	0	1				
2400	1	0	1	0				
3600*	1	0	1	1				
4800*	1	1	0	0				
7200*	1	1	0	1				
9600*	1	1	1	0				
19200*	1	1	1	1				

* not implemented

X Not Used

Word Length

0	0	8 Bits
0	1	7 Bits
1	0	6 Bits
1	1	5 Bits

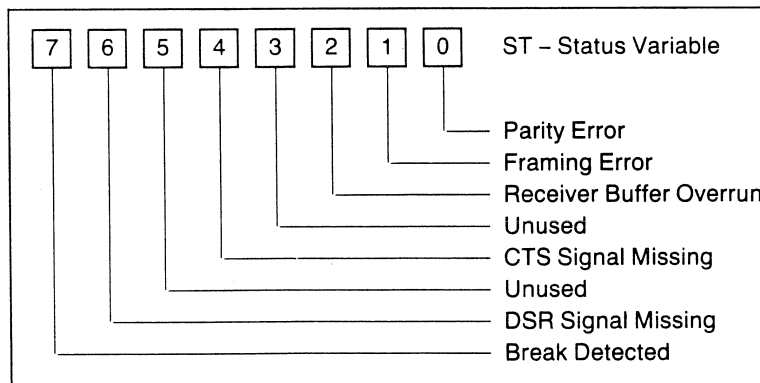
Stop Bits

0	1 Stop Bit
1	2 Stop Bits

Command Register (optional)

Handshake	7	6	5	4	3	2	1	0
0	3 Line							
1	X Line							
	X	X	X					Not Used
Duplex								
0	Full							
1	Half							
Parity	X	X	0	Disabled				
0	0	1	Odd					
0	1	1	Even					
1	0	1	Mark					
1	1	1	Space					

VIC 20 / C64 RS 232 Status



Notes:

- If the LF# is 128 or greater, a Line Feed will be sent after each Carriage Return
- The Secondary Address SA does not affect RS 232 operation
- Before Closing the channel, check output buffer for data with:
VIC 20 : 100 IF ST = 0 AND (PEEK(37151) AND 64) = 64 THEN 100
 110 CLOSE LF
C64 : 100 SX = ST : IF (SX = 0 OR SX = 8) THEN 100
 110 CLOSE LF

IEEE 488 Bus Signals

Manager	ATN	Attention	The controller (PET/CBM/B) sets this signal low while it is sending commands on the data bus. When ATN is low, only peripheral addresses and control messages are on the data bus. When ATN is high, only previously assigned devices can transfer data.
Transfer	DAV	Data Valid	When DAV is low, this signifies that data is valid on data bus.
Manager	EOI	End or Identify	When the last byte of data is being transferred, the talker has the option of setting EOI low. The controller always sets EOI low while the last data byte is being transferred from the controller.
Manager	IFC	Interface Clear	The controller sends its internal reset signal as IFC low (true) to initialize all devices to the idle state. When the controller is switched on or reset, IFC goes low for about 100 milliseconds.
Transfer	NDAC	Data Not Accepted	This signal is held low (true) by the listener while reading. When the data byte has been read, the listener sets NDAC high. This signals the talker that data has been accepted.
Transfer	NRFD	Not Ready for Data	When NRFD is low (true), one or more listeners are not ready for the next byte of data. When all devices are ready, NRFD goes high.
Manager	SRQ	Service Request	Not implemented in BASIC, but available to the user.
Manager	REN	Remote Enable	REN is held low by the bus controller. The PET/CBM has a pin grounded that keeps REN permanently low.
Data	D101-8	Data Input/Output Lines 1-8	These signals represent the bits of information on the data bus. When a D10 signal is low, it represents 1 and when high 0.
General	GND	Ground	Ground connections: There are six control and management signal ground returns, one data signal ground return and one chassis shield ground lead.

Cassette Port



Pin#	Name	Description
A-1	GND	Digital Ground
B-2	+5V	+ 5 Volts to operate cassette circuitry only
C-3	Motor	Computer controlled + 6V for cassette motor
D-4	Read	Read line from cassette
E-5	Write	Write line cassette
F-6	Sense	Monitors closure of any locking type cassette switch

Note: Upper and Lower cassette pins are shorted

IEEE Port Pinouts



Pin #	Pin#*	Mnemonic	Definition
1	1	DIO1	Data Input/Output Line #1
2	2	DIO2	Data Input/Output Line #2
3	3	DIO3	Data Input/Output Line #3
4	4	DIO4	Data Input/Output Line #4
5	5	EOI	End or Identify
6	6	DAV	Data Valid
7	7	NRFD	Not Ready For Data
8	8	NDAC	Data not Accepted
9	9	IFC	Interface Clear
10	10	SRQ	Service Request
11	11	ATN	Attention
12	12	GND	Chassis Ground (IEEE cable shield)
A	13	DIO5	Data Input/Output Line #5
B	14	DIO6	Data Input/Output Line #6
C	15	DIO7	Data Input/Output Line #7
D	16	DIO8	Data Input/Output Line #8
E	17	REN	Remote Enable
F	18	GND	DAV Ground
H	19	GND	NRFD Ground
J	20	GND	NDAC Ground
K	21	GND	IFC Ground
L	22	GND	SRQ Ground
M	23	GND	ATN Ground
N	24	GND	Data Ground (DIO1-8)

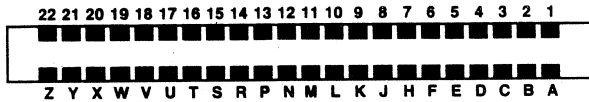
* Pin Numbers for Standard IEEE Cable Connector

PET/CBM User Port



Pin#	Function	Description
1	Ground	System Ground
2	TV Video	Video Out for external displays
3	SRQ	Connected to IEEE SRQ
4	EOI	Connected to IEEE EOI
5	Diag Sense	Held low causes power up to Diagnostic routines
6	READ 1	Connected to cassette 1 read line
7	READ 2	Connected to cassette 2 read line
8	Write	Diagnostic tape write verify
9	Vert	TV Vertical for external displays
10	Horiz	TV Horizontal for external displays
11	GND	
12	GND	
A	GND	
B	CA1	Edge sensitive input of 6522 VIA
C	PB0	PB0-7 are independently programmable for Input or Output
D	PB1	
E	PB2	
F	PB3	
H	PB4	
J	PB5	
K	PB6	
L	PB7	
M	CB2	Special I/O pin of VIA
N	GND	Digital Ground

VIC 20 Expansion Port



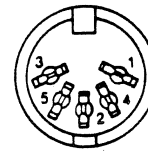
Pin#	Name	Description
1	GND	System ground
2	CD0	Data bus bit 0
3	CD1	Data bus bit 1
4	CD2	Data bus bit 2
5	CD3	Data bus bit 3
6	CD4	Data bus bit 4
7	CD5	Data bus bit 5
8	CD6	Data bus bit 6
9	CD7	Data bus bit 7
10	BLK1	8k decoded RAM/ROM block 1 @ \$2000 (active low)
11	BLK2	8k decoded RAM/ROM block 2 @ \$4000 (active low)
12	BLK3	8k decoded RAM/ROM block 3 @ \$6000 (active low)
13	BLK5	8k decoded ROM block 5 @ \$A000 (active low)
14	RAM1	1k decoded RAM block @ \$0400 (active low)
15	RAM2	1k decoded RAM block @ \$0800 (active low)
16	RAM3	1k decoded RAM block @ \$0C00 (active low)
17	V R/W	Read/Write line from VIC Chip (high-read, low-write)
18	C R/W	Read/Write line from CPU (high-read, low-write)
19	IRQ	Interrupt Request line to 6502 (active low)
20	NC	
21	+5v	
22	GND	
A	GND	
b	CA0	Address bus bit 0
C	CA1	Address bus bit 1
D	CA2	Address bus bit 2
E	CA3	Address bus bit 3
F	CA4	Address bus bit 4
H	CA5	Address bus bit 5
J	CA6	Address bus bit 6
K	CA7	Address bus bit 7
L	CA8	Address bus bit 8
M	CA9	Address bus bit 9
N	CA10	Address bus bit 10
P	CA11	Address bus bit 11
R	CA12	Address bus bit 12
S	CA13	Address bus bit 13
T	I/O 2	I/O block 2 (located at \$9600)
U	I/O 3	I/O block 3 (located at \$9C00)
V	φ02	Phase 2 system clock
W	NMI	6502 Non-Maskable Interrupt (active low)
X	RESET	6502 Reset pin (active low)
Y	NC	
Z	GND	

VIC 20 User Port



Pin#	Function	Description
1	Ground	System Ground
2	+5V	(100 ma maximum)
3	RESET	Cold Start. Memory is destroyed
4	JOY 0	Joystick Switch 0
5	JOY 1	Joystick Switch 1
6	JOY 2	Joystick Switch 2
7	PEN	Light Pen Input. Also Joystick Fire Button
8	SENSE	Cassette Switch sense line
9	Serial ATN	Connected to Serial Bus ATN Line
10	9 VAC + Phase	Transformer output (50 ma. maximum)
11	GND	
12	GND	
A	GND	
B	CB1	
C	PB0	PB0-7 are independently programmable for Input or Output
D	PB1	
E	PB2	
F	PB3	
H	PB4	
J	PB5	
K	PB6	
L	PB7	
M	CB2	Special I/O pin of VIA
N	GND	

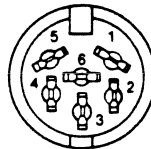
VIC 20 Audio/Video Port



Pin#	Name	Description	Colour
1	+5V	10 ma. maximum	Red
2	GND	System Ground	-
3	AUD	Audio Out	Grey
4	VID L	Video Low	Black
5	VID H	Video High	White

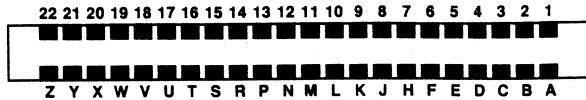
Colour refers to Radio Shack Part# 42-2394

VIC 20 / Commodore 64 Serial Port



Pin#	Name	Description
1	SRQ	Serial SRQ in (active low)
2	GND	System Ground
3	ATN	Serial ATN In/Out
4	CLK	Serial Clock In/Out
5	DATA	Serial Data In/Out
6	RESET	Resets all devices on Serial bus (active low)

Commodore 64 Expansion Port



Name	Pin#	Description
1	GND	System Ground.
2	+5 VDC	Total User Port and Cartridge devices
3	+5 VDC	can draw no more than 450ma.
4	IRQ	Interrupt Request line to 6502 (active low).
5	R/W	Read/Write.
6	Dot	
	Clock	8.18 MHz video dot clock.
7	I/O 1	I/O Block 1 @ \$DE00-\$DEFF (active low) unbuffered I/O.
8	GAME	Active low TTL input.
9	EXROM	Active low TTL input.
10	I/O 2	I/O Block 2 @ \$DF00-\$DFFF (active low) buffered TTL output.
11	ROM L	8K decoded RAM/ROM block @ \$8000 (active low) buffered TTL output.
12	BA	Bus Available signal from the VIC II chip - unbuffered - 1 is maximum load.
13	DMA	Direct Memory Access request line (active low input) is TTL input.
14	D7	Data bus bit 7 *
15	D6	Data bus bit 6 *
16	D5	Data bus bit 5 *
17	D4	Data bus bit 4 *
18	D3	Data bus bit 3 *
19	D2	Data bus bit 2 *
20	D1	Data bus bit 1 *
21	D0	Data bus bit 0 *
21	GND	System ground.
A	GND	System Ground
B	ROM H	8K decoded RAM/ROM Block @ \$E000 buffered.
C	RESET	6502 RESET pin (active low) buffered TTL out/unbuffered in.
D	NMI	6502 Non-Maskable Interrupt (active low) buffered TTL out, unbuffered in.
E	φ2	Phase 2 system clock.
F	A15	Address bus bit 15 *
H	A14	Address bus bit 14 *
J	A13	Address bus bit 13 *
K	A12	Address bus bit 12 *
L	A11	Address bus bit 11 *
M	A10	Address bus bit 10 *
N	A9	Address bus bit 9 *
P	A8	Address bus bit 8 *
R	A7	Address bus bit 7 *
S	A6	Address bus bit 6 *
T	A5	Address bus bit 5 *
U	A4	Address bus bit 4 *
V	A3	Address bus bit 3 *
W	A2	Address bus bit 2 *
X	A1	Address bus bit 1 *
Y	A0	Address bus bit 0 *
Z	GND	System Ground

* = Unbuffered, 1 is TTL load max.

Commodore 64 User Port

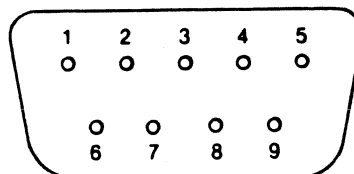


Pin#	Function	Description
1	Ground	System Ground
2	+5V	(100 ma maximum)
3	RESET	Cold Start. Memory is NOT destroyed
4	CNT1	Serial Port counter from CIA #1
5	SP1	Serial Port from CIA #1
6	CNT2	Serial Port counter from CIA #2
7	SP2	Serial Port from CIA #2
8	PC2	Handshaking line from CIA #2
9	Serial ATN	Connected to Serial Bus ATN Line
10	9 VAC +Phase	Transformer output (50 ma. maximum)
11	9 VAC -Phase	Transformer output (50 ma. maximum)
12	GND	
A	GND	
B	FLAG2	
C	PB0	PB0-7 are independently programmable for Input or Output
D	PB1	
E	PB2	
F	PB3	
H	PB4	
J	PB5	
K	PB6	
L	PB7	
M	PA2	Special I/O pin of CIA
N	GND	

Commodore 64 Audio/Video Port

Pin#	Name	Description
1	LUM	Luminance
2	GND	System Ground
3	AUD	Audio Out
4	COMP	Composite Video
5	JACK	Audio In
6	CHR	Chroma out
7	N/C	No connection
8	N/C	No connection

VIC 20 / Commodore 64 Joystick Ports



Pin#	Name	Description
1	JOY 0	
2	JOY 1	
3	JOY 2	
4	JOY 3	
5	POT Y	
6	FIRE	Also the Light Pen input. (C64 port 1 only)
7	+5V	100 ma. maximum
8	GND	System Ground
9	POT X	

Note: See Memory Map for reading Joystick Ports